Part 3:
Advanced Corporate Valuation: Modelling Terminal Value and Stable Parameters in the Discounted Cash Flow Model, Implied Multiples, and the Bridge between Equity Value and Enterprise Value

Chapter 24: Overview of Practical Issues when Computing Terminal Value that Arise because Unlike Humans and Machines, Corporations are supposed to Last Indefinitely

When thinking about the most important things that affect valuations in corporate analysis, mistakes from developing economic assumptions for revenues are the most serious source of error. As discussed in Chapter 1, classic and recurring valuation problems arise from: (1) assuming that firms in industries with relatively easy entry can indefinitely earn a rate of return substantially higher than the cost of capital; (2) ignoring the effects of looming increases in capacity in an industry which outpace growth in demand; (3) relying on opinions and analysis of big companies, famous consulting firms, well respected experts and others who are not making the same kind of investments as you are in the company; (4) believing in fancy new fangled valuation analysis that supposedly produces value from factors other than producing a return above the cost of capital; (5) accepting optimistic forecasts of companies that are trying to increase or maintain returns in the face of increasing competition and who hide information through using incomprehensible financial jargon; and (6) misjudging shifts in the cost structure and demand change in an industry which can quickly render existing assets obsolete. While avoiding these types of pitfalls from making bad assumptions and having good business judgment is the basis for any valuation, there are also some mechanical issues that can have important distortions on measuring the value of a corporation. Many of these problems are related to measurement of terminal value, use and interpretation of P/E and EV/EBITDA multiples, computation of weighted average cost of capital, and correctly measuring the difference between enterprise value and equity value.

Unlike humans, single project financed investments or male/female relationships, corporations are assumed to last indefinitely. This means that when making a valuation, one could either make a forecast that goes out for hundreds or years or one could stop the forecast at some arbitrary date a few years from now and compute the value at that date. The latter approach of arbitrarily stopping the forecast sometime in the not to distant future involves computing terminal value and it is the only practical way to make a valuation analysis of a corporation. In virtually any analysis that is derived from an explicit period of earning free cash flow or dividends followed by realizing a lump-sum terminal value, it is the explicit or implicit assumption used to derive the terminal value that generally has the largest influence on valuation. Coming up with a terminal value includes explicit or implicit assumptions about the three fundamental items that affect the value of anything: (1) how the corporation will be able to earn returns in the long run; (2) what will the risk or cost of capital be for the corporation and (3) what is a sustainable growth rate over an indefinite period in the future. To reflect these items in the terminal value of a corporate model you should measure the weighted average cost of capital; you must compute the bridge between enterprise value and equity value; you may derive P/E and EV/EBITDA multiples, and it is best if you incorporate stable rates of depreciation, capital expenditures, deferred taxes, working capital and other items in the terminal period.

The next few chapters that address terminal value, multiples and other issues specifically related to corporate valuation are not intended to be a typical textbook treatment of discounted cash flow analysis that describes how to compute free cash flow and then add the terminal value and discount the cash flow at the WACC. Instead, the focus is on biases that occur in the valuation analyses that arise from incorrectly considering stable rates of earnings growth, capital expenditures, deferred taxes and working

capital. Further, when addressing valuation from P/E, EV/EBITDA and market to book multiples, issues like how to select comparable company samples for applying the P/E and EV/EBITDA ratios are not the primary focus. Instead, financial models are used to demonstrate which factors – asset life, inflation, growth, risk premium, return, taxes and fade periods or transition factors for each variable -- are the most important drivers of the multiples. Concepts of stable ratios of capital expenditures, deferred taxes given tax and book lives are demonstrated in computing multiples when growth rates, returns and cost of capital is changing over time.

Many ideas about valuation such as the definition of the weighted average cost of capital, free cash flow and net debt are taken for granted by finance professionals, students and academics without working through the underlying valuation logic. For example, when applying the discounted cash flow in a model, the terminal value is universally discounted at the same rate as the free cash flow over the explicit period, even though the company is assumed to have stable cash flow after the terminal period and should be less risky with less volatile cash flow. Similarly, the common practice of de-levering and then re-levering the beta in applying the discounted cash flow model is mathematically incorrect if the cost of debt is different from the risk free rate. An important example is the technique of computing terminal value using the value driver formula that includes returns, growth and the cost of capital (1-g/ROIC)/(WACC-g) contains a large number of implicit assumptions and biases that are very difficult to dissect and impossible to properly interpret. In the next few chapters explanations are presented as to how one can potentially avoid the many distortions in the terminal value calculations and other aspects of discounted cash flow analysis in corporate models. Some of the issues addressed in this part of the book relating to terminal value, multiples and stable ratios used in the discounted cash flow model include:

- How can you make reasonable explicit or implicit assumptions with respect to the long-term growth, profitability and risk that are required in terminal value calculations and derivation of multiples? For companies that are growing faster than the overall economy and that are earning returns substantially above their cost of capital, one generally should assume that growth and returns stabilize. The problem is that the time frame for stabilization, the transition speed of the movement to stabilization and the level of long-term profitably are virtually impossible to predict. The first step is admitting that this is a problem in the DCF analysis that cannot be resolved by elegant financial theory, fancy excel models or simplistic assumptions.

- When you make a growth rate assumption, how is valuation affected by the type of growth you are really assuming? If the growth rate changes from 15% to 3%, the decline in growth may be due to (1) sales declines where the return on invested capital stays constant; (2) declines in the return on investment which cause revenues to fall; or (3) declines in expenditures for capital expenditures and working capital investment with a constant return. Depending on which factor drives the growth rate, the terminal value will differ.

- How should cash flows in the terminal period be adjusted when different assumptions are made for growth rates, profitability and cost of capital over time? Revising free cash flow in the terminal period to reflect normalized cash flow is important for the simple reason that when EBITDA is assumed to grow faster, then capital expenditures that support that EBITDA growth should also grow faster as should working capital investment and deferred taxes. Mechanically, this means the ratio of depreciation to net plant, the ratio of capital expenditures to depreciation, the ratio of deferred taxes to capital expenditures and the ratio of the movement in working capital to EBITDA must change when the growth rate changes. It is therefore be very wrong to assume (as many people do) that the terminal growth rate can be input without also changing a variety of other relationships for normalized cash flow in the terminal period.

- How should the ratio of capital expenditure to depreciation be applied in a model after a change in growth rate when it takes a full life cycle of plant before the rates stabilize? If the growth rate in investment changes from 10% to 5% and assets have a 20 year life, then it takes 20 years before a new ratio of depreciation to net plant is achieved. This is unlike working capital investment which changes immediately after a growth rate change. The stable or equilibrium condition for normalized cash flow should establish a set of consistent parameters including capital expenditures

to depreciation, depreciation rates on net plant, working capital changes to EBITDA and deferred taxes as a percent of capital expenditures that include transition effects that occur over the lifecycle of the investment.

- How can you compute implied P/E ratios, EV/EBITDA ratios and market to book ratios from stable growth rates along with assumptions about the cost of capital after an assumed stable period is reached? Deriving multiples is a reasonable way to avoid many of errors that regularly occur in computing terminal value and can account for changes in growth rates, stable ratios of depreciation and other factors. The ratios can avoid impossible to resolve pitfalls in the value driver formula [TV = NOPLAT x (1-ROIC/g)/(WACC-g)] that computes terminal value from ROIC, growth and cost of capital. Further, implied multiples can be used to compute terminal values that are adjusted for assumed transition periods where one needs to work through an entire life cycle of plant as a transition period.

Chapter 25: Benefits of Carefully Computing the Return on Invested Capital for Historic and Projected Periods in Corporate Models to Check the Reasonableness of the Forecast, Understand where Value Comes From and to Dissect the Structure of a Company's Balance Sheet

The value of any investment comes from the ability to earn a return above the cost of capital and the growth rate in sales or income. Given this most basic proposition in finance, the return on investment and the growth rate should be prominently presented in the summary section and in other areas of a corporate financial model. You could compute hundreds of different ratios from financial statements generated by a model, but the key ratio that ultimately drives the value of a company and also demonstrates the reasonableness of the assumptions for the model is the return on equity and/or the return on invested capital. These rate of return statistics measure the amount of investment that providers of capital have made in the company (either directly or indirectly through not taking dividends when earnings are created) relative to profit that is generated. To illustrate how returns are important in checking assumptions, pretend that the return on investment was 10% in the historic period but your forecast assumes the return increases to 30%. You then better have a very good story using economic fundamentals (competitive position, cost structure and so forth) and proving that the competitive position of the firm becomes stronger to explain why the return is increasing and for how long the increase can be sustained. You can create a highly sophisticated model with careful development of detailed assumptions, but if you do not show the return on investment, your model is not really complete.

When Developing a Model, You Can Work with Either a Free Cash Flow Perspective, an Equity Cash Flow Perspective or Both in Computing Financial Ratios and Valuation

Some people become emotional about whether it is better to focus on the return on equity or return on invested capital in measuring the performance of a company. This issue comes from a more general debate as to whether value should come from equity cash flows or free cash flows. While there is important and subtle reasoning underneath the free cash flow versus equity cash flow arguments, when making a financial model it is usually a good idea to include both free cash flow and equity cash flow perspectives when demonstrating value. The various measures of profitability, cost of capital, rate of return, value and other ratios from a free cash flow and from an equity cash flow perspective are shown below. At this point in the discussion of corporate modelling and valuation it is best not to get too excited about which side of the column you should use. Instead, it is useful to keep equity valuation measures consistent with equity returns, equity cash flows and equity cost of capital and do the same for the free cash flow column.

Item	Equity Cash Flow	Free Cash Flow

Cost of Capital	Cost of Equity (k)	WACC
Value Measure	Market Capitalization	Enterprise Value
Income	Net Income	NOPLAT (EBIT x (1-t))
Profitability	Return on Equity	Return on Invested Capital
Growth	Earnings Growth	Asset Growth
Earnings Valuation	P/E Ratio	EV/EBITDA Ratio
Market Valuation	Market to Book	EV/Invested Capital
Rate of Return	Equity IRR	Project IRR
Present Value	PV of Equity Cash Flow	PV of Free Cash Flow
Value Driver Formula	(1-g/ROE)/(k-g)	(1-g/ROIC)/(WACC-g)

If a company does not have associated investments, surplus cash, discontinued operations, unfunded pension liabilities, fair valuation of derivatives or other complicated items on its balance sheet, the return on equity can easily be reconciled to the return on invested capital. For this simple balance sheet case, the return on invested capital can be computed in an analogous way to return on equity where debt is included along with equity in the denominator as illustrated below. The return on debt is the interest expense plus the interest tax shield divided by the net debt and taxes are net income multiplied by t/(1-t). Using these two equations it can be demonstrated that:

EBIT x (1-t) = NI + Net Interest x (1-t)

and,

Return on Equity = Net Income/Equity Invested

and,

Return on Debt = Net Interest Expense x (1-t)/Net Debt Capital

combining the two implies,

Return on Capital = (Net Income + Net Interest x (1-t))/(Equity + Net Debt)

which means,

Return on Capital = EBIT x (1-t)/Capital Invested

In this special simple balance sheet case, it is easy to see that the return on invested capital equals the return on equity if the firm is financed with no debt when interest and debt are eliminated from the equation. When writing the formulas above, given the frequency of using EBIT x (1-t) in the ROIC formula and in other circumstances, the number is often labelled NOPAT or net operating profit less adjusted taxes. Therefore, the definition of return on invested capital becomes:

ROIC = NOPAT/Invested Capital.

In the above formula, invested capital was simply assumed to be equal to the level of debt plus the level of equity. Because the balance sheet balances, the sum of debt and equity equal total assets. This means the level of invested capital could be replaced by the term net assets that generate EBITDA. Therefore, an alternative definition of return on invested capital is:

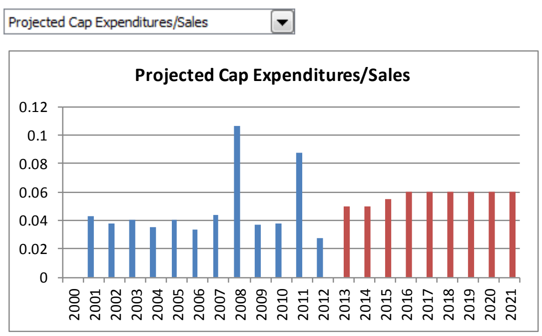
ROIC = NOPAT/Net Assets that Generate EBITDA

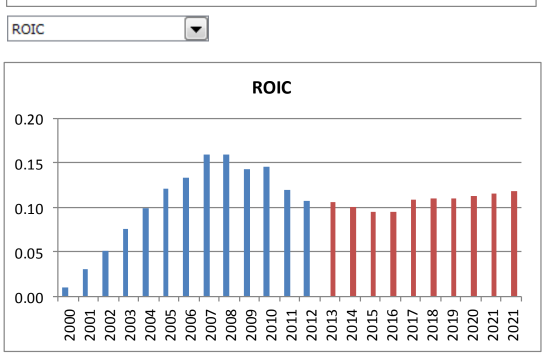
This alternative definition of ROIC is relevant in corporate models because it can be computed before the financial structure of the model is developed (after EBITDA, capital expenditures, working capital and depreciation). The net assets that generate EBITDA include items such as net working capital and net plant assets which are part of the free cash flow development of a model. Therefore, you can compute

the ROIC before you work through all of the debt schedules, the income on non-associated assets and other items. This is similar to computing the project IRR for project finance models. When evaluating whether the assumptions are reasonable, an argument for focusing on the ROIC rather than the ROE is that the ROE is affected by changes in the capital structure, assumptions with respect to other income, dividend policy, interest rate changes and other factors. By reviewing the ROIC you can make sure that your evaluation is not affected by these other items. As explained in the next chapter, the more refined definition of invested capital should be invested capital associated with activities that generate EBITDA.

Some Ideas in Effectively Presenting Return on Invested Capital in Financial Models

A summary page that presents the historic and projected ROIC below assumptions is presented below. In the example, one can select from a list of different assumptions on the top panel; show various financial ratios on the bottom panel and look at the valuations in different scenarios in an area adjacent to the graphs. When creating a page that summarises the entire model, it is useful to allow presentation of a host of different assumptions next to historic levels and observe what happens to the rate of return. Along with the returns and assumptions, inclusion of a drop-down box that contains the various different scenarios allows you to see how changing an assumption affects the returns and whether the assumption is reasonable in light of history.





Scenario: Custom Case

Valuation Year	2012
Terminal Year	2019
WACC	8%

DCF Analysis	Growth rate method Growth Rate	Value driver method ROIC/WACC	Input EV/EBITDA EV/EBITA	Computed EV/ EBITDA EV/EBITA
	2%	2%	9	10
Enterprise Value	3,915,826	3,565,186	2,576,648	3,828,561
Equity Value	3,544,494	3,193,854	3,135,171	3,135,171
Terminal EV/EBITDA	6.09	5.37	9.00	10.00
Value/Share	**26.18**	**23.59**	**23.16**	**25.54**

Cost of Equity 8%

Equity Cash Flow	Growth rate method Growth Rate	Value driver method ROE/ROE	Input PE P/E	Computed P/E P/E
	4%	4%	13	12
PV of Dividends	4.69	4.69	4.69	4.69
Terminal Value	15.69	13.17	10.28	9.49
Total Value	**20.42**	**17.87**	**14.97**	**14.18**

In creating such a summary page, the following step-by-step process can be used:

Step 1: Create a section of the model where you put all of the assumptions and their values as well as the financial ratios and their values. Link the titles and the values of the assumptions and the financial ratios without any blank rows so that you can create a combo box.

Step 2: Insert a dropdown box and use the INDEX function below the assumptions and the financial ratios that allows you to select one of the assumptions and one of the financial ratios. The accumulation of financial ratios in a section and the addition of a dropdown box is illustrated below (see Part 3 for details about how created drop-down boxes like this).

Financial Ratios								
ROE	ROIC	-16.47%	-2.54%	-2.79%	2.50%	8.85%	11.32%	15.07%
ROIC		0.95%	3.04%	5.18%	7.55%	9.88%	12.05%	13.39%
EBITDA Margin		4.92%	7.75%	9.23%	9.07%	8.96%	9.24%	9.51%
Capital Expenditures to Depreciation			98.07%	87.78%	107.82%	96.34%	115.79%	97.55%
Debt to Capital		37%	32%	35%	10%	8%	15%	13%
Debt to Equity		55%	46%	50%	11%	9%	17%	15%
Debt to EBITDA		3.59	2.81	2.40	0.47	0.36	0.56	0.48
EBIT to Interest		0.15	2.84	24.04	40.52	124.66	27.76	23.44
Earnings per Share		-2.76	-0.32	-0.38	0.22	0.77	0.66	0.89
Earnings		(82,764.00)	(14,293.00)	(16,955.00)	14,658.00	50,774.00	61,231.00	81,043.00
EBITDA		77,247.00	100,664.00	122,643.00	131,820.00	138,976.00	158,630.00	179,655.00
Revenues	2	1,568,934.00	1,299,490.00	1,328,607.00	1,452,995.00	1,551,308.00	1,715,869.00	1,888,654.00
ROIC		0.95%	3.04%	5.18%	7.55%	9.88%	12.05%	13.39%
		2000	2001	2002	2003	2004	2005	2006
ROIC		0.95%	3.04%	5.18%	7.55%	9.88%	12.05%	13.39%
		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

ROE
ROIC
EBITDA Margin
Capital Expenditures to Deprecia
Debt to Capital
Debt to Equity
Debt to EBITDA
EBIT to Interest
Earnings per Share
Earnings
EBITDA
Revenues

Step 3: Once you have the selected ration from the INDEX function, create two additional rows that split the selected variable between historic and projected levels using the historic period switch and then make a graph using the F11 key. Move the graph of both the assumptions and the financial ratios onto the summary page.

Step 4: Sometimes there is a irritating problem of setting the minimum scale. To fix this you can first create a function to round and compute the minimum after rounding. Then you can create a macro to adjust the scale on the graph and set the lower scale to the number generated from the minimum function.

While this part of the book generally deals with corporate finance models, there are some analogies to project finance analysis where stable terminal periods and terminal values are less of an issue. When creating a project finance model the recommendation made in Part 1 was to begin the model by computing free tax cash flow (EBITDA less capital expenditures). After free cash flows are established, depreciation expense was the next step in the process which allows you to compute free cash flow and the after tax project IRR. In a project finance model it does not make sense to compute the return on invested capital because as a plant depreciates and dividends are paid, the level of invested capital declines. If the EBITDA is stable or increases over time, the return on investment increases over the life of the project meaning that assessing the return on invested capital does not tell you much about the investment. When creating a project finance model, the project IRR is a good place to stop and take a break because if the project IRR is below the interest rate on debt, it is doubtful that the project will proceed. The project IRR therefore provides a sanity check on the model before other complicated details involving debt structuring are programmed. For a corporate finance model, the analogy to computing the project IRR is to compute the return on invested capital which should also be independent of financing. If computed correctly, the return on invested capital measures the return on all capital provided from the primary business activities of the company. As is the case for the project IRR, the return on invested capital is not affect by whether a company (like Apple) has 100 billion of cash on its balance sheet or if it has 90% leverage. These financial aspects of a company may change over the forecast horizon but they do not affect the return on invested capital. It is for this reason that the return on invested capital is such a convenient ratio in checking whether you have made reasonable assumptions and explaining why the value of a company is changing in different scenarios.

Before proceeding to the next section of the model where detailed mechanics of the return on invested capital calculation are presented, a couple of real world problems with computing the return on invested capital should be noted. If a company has a large impairment of plant, the equity balance and the invested capital balance will suddenly decline which decreases both equity investment and invested capital. In subsequent years, the return on invested capital will have a higher values than they would have had the write-off not occurred. A similar problem occurs after a large impairment to goodwill or a large re-structuring charge. Alternatively, after a large acquisition goodwill and intangible assets increase that can cause the return on invested capital to suddenly fall. In these cases with write-offs and acquisitions you should be cautious about interpretation of the return on invested capital and in particular attempting to make comparisons between the return on investment and the cost of capital. Sometimes it may be preferable to re-compute the invested capital without write-offs or goodwill for purposes of evaluating the fundamental performance of the company.

Chapter 25: Detailed Calculation of Invested Capital that Forces You to Understand the Financial Structure of a Corporation and the Mechanics of Computing the Return on Invested Capital Using the Guiding Principle that Relates Balance Sheet Items to EBITDA

In computing the invested capital when developing the ROIC, the general idea is to dissect the balance sheet and split items that are related to generating EBITDA (such as net plant) from items that produce income an expenses other than EBITDA (such as debt which generates interest expense). While it may seem mundane and relatively simple to establish asset and liability items that should be included in the invested capital because they are related to producing EBITDA, the process can in fact be quite tricky. A whole (relatively long) chapter is devoted to this subject because when computing invested capital for purposes of ROIC, the mechanics of making this segregation are important in many valuation and financial modelling contexts and have some important key side benefits. Three of these benefits include:

1. Once balance sheet items are identified and segregated on the basis of those that lead to the generation of EBITDA, the same segregation process that is used in the invested capital calculation can be used to evaluate the difference between equity value and enterprise value when computing discounted cash flow. However in computing the difference between equity value and enterprise value, all of the items should be measured at market value rather than book value.

2. When measuring enterprise value from market capitalisation in computing the EV/EBITDA ratio or deriving the aggregate value in an acquisition from equity consideration, it is also necessary to identify items that bridge the enterprise value with the equity value. Items that form this bridge (and should be measured at market value) can be identified using the same thought process in segregating the balance sheet and computing invested capital.

3. When computing the WACC associated with free cash flow and measuring cost of equity with valuation metrics that are derived from equity cash flow such as equity beta, market to book ratio analysis or implicit cost of equity from the growth rate and the P/E ratio, a comprehensive set of items should be used in adjusting the WACC. The WACC calculation should not only include gross debt, but also surplus cash and all of the other items in the bridge between equity capital and enterprise value. Thus, all of the items identified for reconciling the invested capital calculation and for the bridge between enterprise value and equity value should also be included in the WACC calculation.

To illustrate the general process of segregating balance sheet items for purposes of computing invested capital, assume a company has associated investments on the balance sheet and other income from associated investments on the profit and loss statement that is not included in EBITDA. The income from associated assets is not included in the numerator of the ROIC calculation because it is not included in EBIT x (1-t). This means the investment in associated assets should also not be included in the denominator of the ROIC calculation. In this situation, some of the debt and equity that is tabulated as the invested capital of the company is implicitly used to finance the associated investments. As there is less financing for core EBITA producing assets, the amount of debt and equity on the balance sheet associated with financing EBITDA should be reduced by the associated investments. Because free cash flow is driven by EBITDA, the present value of free cash flow and the enterprise value also does not include the income generated from investments in associated companies. But the income from associated investments does accrue to the equity owners of the company owners of the company – these assets presumably do have some value if they are generating income. This means that the value of investments in associated companies should be added to the enterprise value when establishing equity value. The manner in which the associated investments is an adjustment to the invested capital calculatio n and at the same time an adjustment in moving form enterprise value to equity value is the same for many other items on the balance sheet.

Making Invested Capital Calculations that Force you to Dissect the Financial Structure of a Corporation and Understand Items that Cause the Enterprise Value to Differ from Equity Value

Determining what items should be included and not included in the invested capital calculation can be confusing until you strictly follow the principle that items which do not generate on-going EBITDA should not be part of invested capital. Further, because the level of invested capital comes from items on the balance sheet and because the balance sheet must balance, invested capital can be computed from an indirect or a direct perspective as explained below:

- The first perspective (the indirect and commonly applied method) is beginning with debt and equity capital provided to generate EBITDA. From the debt and equity capital perspective, any asset or liability that provides cash flow that is below the EBITDA line should not be included in EBITDA and any liability that involves finance costs should be included in invested capital. This perspective is labelled the financing perspective in the discussion below.

- The second perspective is directly identifying assets and liabilities that are associated with producing EBITDA. For example, the balance of net plant, the level or accounts receivable and the level of accounts payable are directly associated with the operations of a company and the EBITDA. This perspective is labelled the net asset producing EBITDA perspective below.

Both of the perspectives should provide the same answer and it is a good idea to compute the invested capital necessary to generate EBITDA both ways to make sure you have worked through the entire balance sheet. After you have reconciled both methods and assured that you end up with the same invested capital number, you have completed a lot of the process for identifying items that are in the bridge between equity capital and enterprise value. Items other than equity capital using the first perspective do not affect enterprise value but are part of the equity value of the company.

The excerpt below illustrates how invested capital can be derived beginning with the liability side of the balance sheet and subtracting net assets that do not produce EBITDA or alternatively from the asset side of the balance sheet. Note the test below the two calculations that verify the equality of both approaches. The second perspective is that of including net assets that do generate EBITDA. The top part of the excerpt is consistent with adjustments that are made in moving between the enterprise value and the equity value when computing either the equity value in a discounted cash flow analysis or the EV/EBITDA ratio. On the other hand, the lower section of the calculation includes items such as current assets, net plant and current liabilities that should be computed when evaluating operating cash flow and working capital in the initial part of a model. The exercise of computing invested capital in this manner assures that you have not left anything out and have considered which side of the ledger every item should be on as a function of whether it does or does not generate EBITDA. The next paragraphs of this chapter discuss how to classify various items that may appear on the balance sheet of a company between the two sections below.

Timeline	Custom Case		2006	2007	2008	2009	2010	2011	2012	2013	2014
Historic timeline switch	13		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Explicit period switch	8	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE
Valuation year	1		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
Closing Balance Sheet for valuation	1		FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
Terminal value switch	1		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
ROIC											
Invested Captial - Perspective of Capital Funding EBITDA											
Equity Capital			562,863.00	656,215.00	634,719.00	715,945.00	795,790.00	758,968.00	858,620.00	904,866.13	950,206.53
Minority Interest			5,870.00	7,802.00	9,335.00	12,081.00	0.00	0.00	0.00	0.00	0.00
Gross Debt			86,532.00	29,428.00	286,417.00	251,668.00	127,302.00	326,174.00	607,012.00	638,689.57	641,308.63
Pension Obligations			146.00	0.00	78,897.00	68,140.00	76,086.00	155,263.00	159,158.00	159,158.00	159,158.00
Total Capital			655,411.00	693,445.00	1,009,368.00	1,047,834.00	999,178.00	1,240,405.00	1,624,790.00	1,702,713.70	1,750,673.16
Less: Cash			13,914.00	19,978.00	19,964.00	18,948.00	6,755.00	7,783.00	13,275.00	0.00	0.00
Less: Non-Associated Investments											
Less: Net Derivative Assets											
Less: Notes Receivable			74,428.00	88,469.00	94,652.00	94,457.00	92,860.00	102,322.00	102,723.00	102,723.00	102,723.00
Total Invested Capital			567,069.00	584,998.00	894,752.00	934,429.00	899,563.00	1,130,300.00	1,508,792.00	1,599,990.70	1,647,950.16
Invested Capital - Perspective of Net Assets Generating EBITDA											
Current Assets			216,523.00	247,393.00	293,534.00	299,293.00	305,864.00	334,523.00	421,978.00	479,063.29	500,623.30
Net Plant			464,442.00	486,522.00	587,196.00	602,576.00	604,693.00	685,487.00	725,836.00	772,589.06	815,863.41
Goodwill			75,537.00	76,338.00	200,035.00	201,682.00	200,153.00	219,730.00	269,897.00	269,897.00	269,897.00
Other Assets Used in Business			50,067.00	66,972.00	119,118.00	113,772.00	114,069.00	167,889.00	432,942.00	432,942.00	432,942.00
Less: Current Liabilities			177,836.00	206,725.00	242,531.00	196,009.00	214,340.00	225,651.00	282,962.00	287,604.60	296,082.62
Less: Deferred Taxes			35,715.00	49,111.00	16,765.00	43,034.00	65,585.00	(889.00)	10,008.00	18,005.04	26,401.93
Less: Other Current Liabilities			25,949.00	36,391.00	45,835.00	43,851.00	45,291.00	52,567.00	48,891.00	48,891.00	48,891.00
Total Invested Capital			567,069.00	584,998.00	894,752.00	934,429.00	899,563.00	1,130,300.00	1,508,792.00	1,599,990.70	1,647,950.16
Test			TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

A similar process to reconciling invested capital can be developed for determining the aggregate value of a transaction. This aggregate value can be used in an analogous way that capital expenditures without interest are presented in a project finance model. Once the aggregate value is computed, you can compute the overall un-geared IRR on the transition before taxes and after taxes. The aggregate value should stay the same no matter how the acquisition is financed and can be in an indirect method using the amount of money that is paid for the company net of bridge items that remain with the company after the acquisition. Alternatively, the aggregate value can be computed from the equity consideration paid plus all of the bridge items that produce cash flow for the equity investors. An example of the way such a reconciliation can be presented is shown in the table below.

Entreprise Value Reconciliation	
Enterprise Value from Transaction Data	
Total Equity Paid	138.66
Total Debt Issued Net of Fees	411.05
Add: Pensions	60.00
Less: Notes Receivable	-130.00
Total	479.70
Enterprise Value from Balance Sheet Data	
Consideration	470.00
Fees	4.70
Dividends Paid	40.00
Debt	120.00
Add: derivative liabilities	30.00
Add: Pensions	60.00
Less: Surplus Cash	-40.00
Less: associated investments	-75.00
Less: notes receivable	-130.00
Total	479.70

The General Idea of Drawing an Imaginary Line Underneath EBIT and Dividing Up Assets and Liabilities According to Whether they Produce Income or Incur Expenses Above or Below the Line

The important and tricky part of the process of computing the return on invested capital is determining whether a balance sheet item is or is not associated with generating on-going EBITDA. Using EBITDA to guide which side of the invested capital ledger to place an item is not always clear from the title of an item on the balance sheet or from a theoretical perspective. Further, it is difficult to come up with a simple checklist that can be used in every case to split-up the balance sheet for purposes of computing invested capital or the bridge between enterprise value and equity value. In deriving invested capital from the perspective of funding, you can begin with equity capital including minority interest. All of the short-term debt, long-term debt capital leases and other items that carry an interest charge should be included in the invested capital using the indirect perspective as long as the interest expense is not included in EBITDA. While this is often straightforward, somewhat more complex items involve pension liabilities, long-term notes and accounts receivable, vendor financing, derivatives, stock options, decommissioning provisions, deferred taxes and operating cash. For example, if a vendor gives the company an interest free loan that at the same time increases expenses that are part of EBITDA, then the vendor loan should not be part of invested capital. On the other hand if the loan includes interest and does not affect the EBITDA it should not be in invested capital.

To illustrate the thought process behind the guiding principal of EBITDA, consider the example of long-term notes receivable and long-term accounts receivable. A company may provide loans to other associated companies or to non-associated companies that produce some kind of interest income. If the loan interest is not included in the free cash flow that establishes enterprise value, then the notes receivable, whether classified as long-term notes or short-term notes should be part of the bridge between enterprise value and equity value. When the notes are redeemed, cash flow will be realized by investors and it should not be part of EBITDA or free cash flow. If the notes receivable are made at below market rates of interest, then the market value of the notes included in the bridge should be lower than the amount that is recorded on the balance sheet. A long-term account receivable should in general in theory be similar to a notes receivable and the timing of when the receivable is not relevant in valuation. The treatment of a long-term receivable depends if it is a one-off item and it is not directly or indirectly included in EBITDA and free cash flow used to compute enterprise value. If the long-term accounts receivable is not expected to recur and if the redemption of the accounts receivable is not already included in free cash flow (as an increase from lower working capital), then it should be included in the bridge between equity value and enterprise value. Otherwise redemption of the long-term receivable is included in the free cash flow no adjustment is necessary.

On the liability side, the guiding principle of EBITDA is illustrated by the case of un-funded pension obligations that arise from not placing sufficient funds in a trust fund to cover liabilities created from defined benefit plans. These liabilities should be excluded from direct calculation of invested capital and included as comparable to debt. To demonstrate this, consider two companies, one with a surplus in its pension trust fund and another with a liability for unfunded pension obligations. For the company with the pension surplus, part of the debt and equity investment in the company made by investors it was implicitly to finance the extra amount in the pension fund and the amount of cash taken from equity investors will be reduced in the future. As the investment attributed to the surplus pension fund does not generate EBITDA, it should not be include in the invested capital associated with NOPLAT. Where the company has a deficit in the pension plan, the principle is the same. Here, not enough debt and equity have been invested to support the NOPLAT and the EBITDA meaning that the invested capital must be increased.

Distinguishing between accounts receivable and inventory other related current assets on the one hand and surplus cash on the other hand illustrates the process of segregating balance sheet accounts. If a company would stop operating today, the accounts receivable and inventory would produce cash flow for shareholders just like the surplus cash. However, there are key differences between these current asset items and the surplus cash. First, the implicit finance cost of accounts receivable and inventory is incorporated in EBITDA and enterprise value. If a company demands faster payment to reduce accounts receivable balances, the reduction in these balances will probably force the company to reduce prices or may lower the volumes of sales. Alternatively, if a company is more generous with payment terms, revenues and EBITDA should increase. In both cases the financing effects of accounts receivable are part of the EBITDA. Similarly in the case of inventories, the company could reduce its inventory, but may have to increase the cost of goods sold implying that financing effects of the inventories are included in the EBITDA. By contrast, there should be no relationship between surplus cash and EBITDA as the income from surplus cash should be recorded as interest income. Second, unlike surplus cash, the accounts receivable items are necessary in order to produce the free cash flow and are therefore incorporated in enterprise value. Third, as long as the firm is in existence and growing, the value of accounts receivable and inventories will never be realized as cash flow to equity investors because previous accounts receivable are replaced with investments in new accounts receivable and old inventories are replaced with new inventories.

Constructing a Long-term Model to Create Proofs of How Various Items Should be Treated in Various Valuation Problems

When attempting to segregate different items and computing how the item affects value, people often make general arguments that can be disputed by an counter arguments and a lot of time is wasted by smart people having quasi political beliefs about the treatment of different of issues. For example in arguing that accumulated deferred taxes should be included in the indirect calculation of invested capital, an analyst noted that: "Buffett's Berkshire has over $50b in deferred tax liability, and he brags about it for over 30 years now more as a source of 'asset' financing than a pure liability reality. Hence, I think deferred taxes are a form of financing (and hence included in invested capital)." Rather than wasting a lot of time on this type of argument, a long-term model can be developed to prove how the item is treated. As long as you understand the accounting and the cash flow implications of various issues, you can use the long-term analysis to resolve many issues.

The mechanics of the long-term analysis described below are applicable to a number of subjects addressed in this part of the text. Later on, questions about whether the value driver formula (1-g/ROIC)/(WACC-g) really works and how to compute stable levels of capital expenditures relative to depreciation are addressed with this framework. Long-term analysis is necessary because of the general notion that corporations last indefinitely and do not die like project financed investments, humans and relationships. The long-term analysis follows the following step by step process:

Step 1: Set-up long-term analysis with that includes growth rate and discount rate assumptions as well as cash flow generated to equity holders and the accounting aspects of the problem.

Step 2: Input a valuation year after the start of the model so that balance sheet items (such as accumulated deferred taxes) can be evaluated for purposes of the valuation.

Step 3: Compute the true value of the cash flows using the long-term analysis.

Step 4: Use the same assumptions to create a discounted cash flow model with a terminal value and a bridge between equity value and enterprise value.

Step 5: Evaluate the difference between the equity value computed in step 4 and the equity value computed in step 3.

To illustrate the manner in which a long-term model can resolve issues, consider the simple case of accounts payable. One could potentially make the argument that accounts payable are not unlike other debt obligations that come due and are included in the indirect method of computing invested capital. However, unlike other forms of debt, the implicit cost of delaying payments from suppliers is part of EBITDA. If a supplier offers very attractive payment terms but at the same time increases the cost of supplying materials, this increased cost is included as an operating expense and implicitly part of EBITDA. In addition to the financing cost, the treatment of payables is affected by the question of whether the level of accounts payable changes over time. In general, the accounts payable are assumed to increase with the growth of the company implying that the accounts payable provide cash flow and are never a liability that must be repaid. If the accounts payable continue to grow and the growth is included in the working capital changes in the free cash flow, then there is no cash flow that must be incurred by equity investors that is not already included in free cash flow (as changes in working capital). Indeed, the accounts payable never really come due as a cash obligation to equity investors. Instead, they are replaced by new payables and the implicit financing cost is included in the operating expenses.

To use the long-term model in demonstrating the appropriate treatment of accounts payable, the example below assumes a sales growth rate of 5%, and operating margin of 30% (implying that expenses are 70% of sales), a WACC of 10% and an assumption that expenses are paid in 100 days. In modelling the accounts payable, the increase in true cash flow that is paid is to suppliers is computed from the cash flow that is avoided in the current period (100 days or 27.4% of the operating expense). The true cash flow is the revenues less the outflow of cash to suppliers as illustrated in the excerpt below (the actual model extends to year 300).

To model the value assuming that the company is purchased in year five, a number of techniques that were introduced in Part 1 can be applied as follows:

1. Construct a period counter that extends to 300 years (the entire spreadsheet using 16,000 columns cannot be used and causes the spreadsheet to be slow and large). Use the SHIFT, CNTL, → and SHIFT, ALT, → keys to cut-off the sheet after deleting the columns after year 300.

2. Create a switch variable that is true when the period counter is greater than the valuation year (assumed to be 5).

3. To compute the value at the valuation year using the NPV function, you can replace the equity cash flows before the year in question with a FALSE value. If the cash flows before year five have a value of zero, then the present value of the cash flow accrues to the first year instead of year five. In order to place a FALSE in the cells rather than a zero for the first five years and use the NPV formula, use an IF statement without an argument for the false condition as illustrated below.

   Equity Cash Flow for Valuation = IF(Valuation period switch, Equity Cash Flow)

   Value = NPV(WACC, Equity Cash Flow for Valuation)

Assumptions	
Sales Growth	5.00%
Operating Margin	30.00%
A/P Days	100
A/P as Percent of Expenses	27.40%
WACC	10.00%
Initial Level of Sales	200.00
Valuation Year	5.00
Explicit Period	4.00
Terminal Period	9.00

True Cash Flow to Equity												
Period	Driver	0	1	2	3	4	5	6	7	8	9	10
Valuation Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE
Sales	5.00%	200.00	210.00	220.50	231.53	243.10	255.26	268.02	281.42	295.49	310.27	325.78
Operating Expenses	70.00%	140.00	147.00	154.35	162.07	170.17	178.68	187.61	196.99	206.84	217.19	228.05
Operating Expenses Paid from Current Year Expense	72.60%	101.64	106.73	112.06	117.67	123.55	129.73	136.21	143.02	150.17	157.68	165.57
Operating Expenses Paid from Prior Year Expenses	27.40%		38.36	40.27	42.29	44.40	46.62	48.95	51.40	53.97	56.67	59.50
Equity Cash Flow			64.92	68.16	71.57	75.15	78.91	82.85	87.00	91.35	95.91	100.71
Equity Cash Flow for Valuation			FALSE	FALSE	FALSE	FALSE	FALSE	82.85	87.00	91.35	95.91	100.71
True Value of Company	1,657.07											

Once the true value has been established, a model that contains different theories of value using balance sheet items can be developed as illustrated below. In creating this model, you can start with the valuation year; see how much the balance sheet item – in this case accounts payable – has built up. Then you can compute the terminal value and simulate the calculation where the accounts payable are treated like debt in the bridge between enterprise value and equity value. To simulate a valuation that begins in year six (the year after the valuation year) and ends in year nine (per the assumed four year explicit period), you can do the following:

1. Construct switch variables for the valuation year, the explicit period (using the AND function) and the terminal period as documented in Part 1.

2. Compute the accounts payable balance using an opening balance, adding the amounts created from the delaying expenses in the current year and subtracting amounts paid in the prior year. Also compute the EBITDA that is defined as the cash flow (CF).

3. Compute the explicit period cash flow with an IF statement in a similar manner as above so that the valuation will be as of year five and years prior to the valuation year will contain a value of FALSE. Then compute the value of the explicit period cash flows using the NPV formula.

4. Compute the terminal value using the growth rate formula CF x (1+g)/(WACC-g) and multiply the result by the terminal value switch. To assure that the value will be computed as of the valuation year, also use an IF statement using the explicit year switch as demonstrated below. Then compute the present value of the terminal value using the NPV function.

   Terminal Value = IF(Explicit Switch, CF x (1+g/(WACC-g) * Terminal Switch)

5. Sum the NPV of the explicit cash flows and the NPV of the terminal cash flow to establish the enterprise value. Then subtract the closing balance of the accounts payable to compute the equity value and compare this value to the true value of the equity cash flows using the long-term model.

Valuation assuming A/P is Debt		0	1	2	3	4	5	6	7	8	9	10
Explicit Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE
Terminal Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE
Valuation Period		FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
A/P Balance												
Opening Balance		0.00	38.36	40.27	42.29	44.40	46.62	48.95	51.40	53.97	56.67	59.50
Add: Amounts Generated		38.36	40.27	42.29	44.40	46.62	48.95	51.40	53.97	56.67	59.50	62.48
Less: Amounts Re-paid		0.00	38.36	40.27	42.29	44.40	46.62	48.95	51.40	53.97	56.67	59.50
Closing Balance		38.36	40.27	42.29	44.40	46.62	48.95	51.40	53.97	56.67	59.50	62.48
EBITDA		60.00	63.00	66.15	69.46	72.93	76.58	80.41	84.43	88.65	93.08	97.73
EBITDA in Explicit Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	80.41	84.43	88.65	93.08	FALSE
PV of EBITDA	273.05											
Terminal Value		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	0.00	0.00	0.00	1,954.67	FALSE
Enterprise Value	1,335.07											
Less: A/P Classified as Debt	48.95											
Net Equity Value	1,286.12											
Value Difference	370.95											

The above analysis demonstrates that if accounts payable were to be treated as debt, the value of the company would be understated relative to the true amount. This comes about because (1) accounts payable are subtracted from the enterprise value even they do not come due and (2) the EBITDA does not include reflect true cash flow whereby cash outflows are reduced because of the continuing delay in payment of bills. When correcting these two elements and re-computing the value using the technique shown above with the explicit period and terminal period cash flow, the value is exactly the same as the true long-term amount as shown in the excerpt below. This may seem like a lot of work to prove something that you already knew, but the process of making the proof is important thing. If you are making valuations using EV/EBITDA or applying the discounted cash flow model, you will probably at some time have debates about which items should be included in the bridge. Hopefully, the idea of creating a long-term analysis and then establishing a balance sheet from growth rate assumptions can help you resolve the arguments.

Valuation with Working Capital Treatment													
Explicit Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Terminal Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
Valuation Period		FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
EBITDA		60.00	63.00	66.15	69.46	72.93	76.58	80.41	84.43	88.65	93.08	97.73	102.62
Working Capital Changes		-38.36	-1.92	-2.01	-2.11	-2.22	-2.33	-2.45	-2.57	-2.70	-2.83	-2.98	-3.12
Free Cash Flow		98.36	64.92	68.16	71.57	75.15	78.91	82.85	87.00	91.35	95.91	100.71	105.74
	NPV												
Free Cash Flow in Explicit Period	281.36	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	82.85	87.00	91.35	95.91	FALSE	FALSE
Terminal Value	1,375.71	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	0.00	0.00	0.00	2,014.18	FALSE	FALSE
Total Enterpise and Equity Value	1,657.07												
True Value	1,657.07												

Chapter 25: Items in the Invested Capital Segregation that Force you to think about Cash Flow, Accounting and Cost of Capital Issued

Many balance sheet items can be simulated with type of process used above for accounts payable and have an unambiguous classification in terms of invested capital and enterprise value. Unfortunately, the answer for other balance sheet items in terms of classification is “it depends.” Items discussed in this chapter that are more ambiguous include accumulated deferred taxes, operating cash and derivative assets and liabilities. The treatment of these and other items can only be resolved by understanding the accounting and on-going cash flow implications of the items. A further issue related to classification of assets is the treatment of different items is the weighted average cost of capital calculation. In Classification of other items Accumulated deferred taxes may be the most common source of error when segregating balance sheet items between those related to generation of EBITDA and those related to costs and income that are not part of EBITDA. Accumulated deferred taxes are often recorded as a liability on the balance sheet

Deferred Taxes are Associated with Operations and Generally Should not be Treated as Invested Capital Just like Accounts Payable

Accumulated deferred taxes may be the most common source of error when segregating balance sheet items between those related to generation of EBITDA and those related to costs and income that are not part of EBITDA. Accumulated deferred taxes are often recorded as a liability on the balance sheet representing the reduced amount of taxes that has been paid relative to the amount of taxes that has been recorded on the profit and loss statement. The general idea is that taxes paid have been reduced on a temporary basis and over the lifetime of assets on the balance sheet, the taxes paid will eventually be more than the taxes on the books as the beneficial tax deductions expire. The most typical example is that of book and tax depreciation where the tax depreciation rate is greater than the book depreciation in early years of the life of an asset. In computing book income taxes in NOPLAT, on the income statement, and for in the calculation of free cash flow, book depreciation and intangible amortization is used rather than tax depreciation. Actual cash taxes paid by a company are a function of tax depreciation and allowable amortization allowable for tax purposes. The accounting and cash flow treatment of deferred taxes is illustrated on the simple example below where an asset has a four year book life and a two year tax life.

Assumptions					
Book Life	4				
Tax Life	2				
Tax Rate	40%				
Capital Expenditures	100,000				
Book and Tax Depreciation					
Year		1	2	3	4
Book Depreciation		25,000.00	25,000.00	25,000.00	25,000.00
Tax Depreciation		50,000.00	50,000.00	-	-
Tax - Book Depreciation		25,000.00	25,000.00	(25,000.00)	(25,000.00)
(Tax - Book) x Tax Rate		10,000.00	10,000.00	(10,000.00)	(10,000.00)
Accumulated Deferred Taxes					
Opening Balance		-	10,000.00	20,000.00	10,000.00
Add: Deferred Tax Change		10,000.00	10,000.00	(10,000.00)	(10,000.00)
Closing Balance	-	10,000.00	20,000.00	10,000.00	-

The problem with the simple example above is that as capital expenditures are made, tax depreciation keeps increasing and it is continually more than book depreciation. Indeed, after a cycle of plant in which after retirements begin, the changes in deferred tax stabilize to a fixed level relative to capital expenditures if the growth rate in capital expenditures is constant. As capital expenditures continue, the deferred tax liability never comes due and the deferred tax liability continues to increase.

If deferred taxes really cause equity investors to incur future cash outflows that are not already deducted as part of free cash flow, then the value of the accumulated deferred tax liability should be deducted from enterprise value. However, when a company is continually making capital expenditures, the negative future cash flows are never incurred. Here, as was the case with accounts payable, a new larger cash inflow from a new liability continually replaces the earlier liability. Further, as is the case with accounts payable, there are no interest expenses below the EBITDA line that are associated with the liability. Thus when segregating deferred taxes for purposes of computing invested capital and enterprise value the treatment for deferred taxes associated with capital expenditures (such as accelerated depreciation) should be treated as a positive part of free cash flow and not included as an obligation of equity holders. Therefore, the cash flow should be computed using the formula:

Free Cash Flow = EBITDA – Capital Expenditures – Working Capital Changes + Deferred Tax Changes

A second example of deferred tax is the case of net operating loss carryforwards. When the carryforward is created in periods of negative income, taxes recorded on the books are negative and the actual taxes paid are zero. In later periods when the income is positive, the carryforward is used and additional cash flow relative to income occurs. In this case the accumulated deferred tax is an asset on the balance sheet. In a sense deferred taxes associated with the carryforward is kind of like making an investment when the carryforward is created and then receiving a return on the investment when the carryforward is used. The situation with carryforwards is more complicated and other items that are not associated with continually growing capital expenditures. In the case of tax carryforwards, if the cash flow from the explicit period encompasses the full period until the extinguishment of the carryforward, then that cash flow should be included in EBITDA and no adjustment should be in the terminal value. On the other hand, if the explicit period ends when the carryforward is generating cash flow (because the taxes paid are less than they would be if the earlier losses had not occurred) then there is some value of the carryforward that continues after the terminal period. This value cannot be measured by simply assuming the cash flow continues and grows using the standard growth formula. In theory, the only way to measure the cash flow associated with an expiring tax loss carryforward is to directly estimate the cash flows and then to discount those cash flows at the cost of capital.

When computing invested capital, accumulated deferred taxes should generally be on the direct side of the ledger (along with net plant, working capital and other items that support EBITDA) rather than items such debt and surplus cash that are on the net financing part of the ledger. This is because the deferred taxes that can in part finance an investment are not contributed by investors. Assume that two companies are identical in every respect except that one company is able to use accelerated depreciation and the second is cannot. The company that uses deferred taxes has a cost advantage vis a vis the other company should have higher value and a higher return on invested capital. In the case of deferred tax assets generated from a tax carryforward, the situation is again more complex. Here, one can imagine that the company has made an investment in the deferred tax assets and will receive the return when the carryforward is used. This deferred tax asset related to the carryforward does not generate NOPLAT (as the taxes are derived from book income) and one could imagine that the asset could be liquidated (in the way a pension surplus could be liquidated). These arguments suggest that accumulated deferred taxes associated with carryforwards should be on the financing side of the ledger.

The Tricky Issue of Operating Cash that Produces Interest Income Below the EBITDA Line and Also is an Asset Used in Business Operations

In terms of surplus cash and other investments that are not necessary for operating the business, the treatment for the invested capital calculation is fairly clear. On the other hand, appropriate classification of cash needed to operate the business is more complex. In the case of surplus cash, income is recorded as interest income below the EBITDA line and the surplus cash is not an asset that is necessary to produce EBITDA. Therefore, when computing amounts of financing required to generate EBTDA, if some of the debt and equity financing has been used to finance surplus cash instead of assets that generate EBITDA, this amount should be deducted from the total capital on the balance sheet. For operating cash, you could make the argument that it is like surplus cash as it generates income below the EBITDA line. You could also make the argument that operating cash is like accounts receivable where the investment is necessary to generate EBITDA -- when a company needs more operating cash it will have to increase invested capital and ultimately realise higher revenues to compensate for the investment. If operating cash (sometimes measured as two percent of revenues) is considered as a financing item, the equity value is increased relative to the enterprise value while if the operating cash is considered as a necessary asset for running the business, then free cash flow is lower and the equity value is reduced. Using the two percent rule of thumb, this swing could be four percent of the equity value of a company.

It is often taken for granted that operating cash should be differentiated from surplus cash (at least in theory), this issue is not quite so obvious. The idea behind accounting for operating cash in a similar manner to accounts receivable is that some level of operating cash is necessary to run the business and that free cash flow could not be generated without the operating cash. However, a counter argument can be made that operating cash is a by-product of operating a company and it provides value to equity. The argument that cash is necessary to generate the EBITDA is not much different than saying an overdraft short-term debt facility is necessary to run the business. It would be standard practice to deduct borrowings from the overdraft facility from the enterprise value. The argument that cash is necessary to generate the EBITDA is not much different than saying an overdraft short-term debt facility is necessary to run the business. It would be standard practice to deduct borrowings from the overdraft facility from the enterprise value.

Part of the confusion in classification of operating cash in part comes from the effect of cash on the weighted average cost of capital and the lower return that is earned on cash relative to other investments. The issue of how to treat operating cash can be in part resolved by considering a silly company that does nothing but take investor's money and then re-invests that money in treasury bills. This company can be used for resolving various arguments because there is no ambiguity with respect to the cost of capital. If the company is growing fast and requires a lot of operating cash to run the business, but then invests this surplus cash in the same treasury bills, the operating cash has no cost for investors. If the enterprise value is defined as the present value of the income from the treasury bills not including the operating cash, then the added treasury bills from operating cash should clearly be added to the enterprise value. The issue is more confusing when a more realistic example is used. If the weighted cost of capital does not include operating cash (see the discussion below about adjusting beta for net debt), then cash reduces the cost of capital and provides income implying it should increase equity value. If the weighted cost of capital without the effect of operating cash is applied to free cash flow (reducing the value of free cash flow) is applied, then the operating cash should be added in a similar manner to the treasury bill example.

The treatment of operating cash can be resolved with the type of long-term proof demonstrated in the last chapter. If the cost of capital on the operating cash is independent of the operating cash implying that the cost of capital is higher than it would be if operating cash were included in the measuring the volatility of cash flow, then operating cash should be treated in the same way as surplus cash. In this calculation, the free cash flow has a lower value that it would have had were the low risk operating cash were included in the weighted average calculation. The value of the operating cash is then separated from the operating cash and it includes cash outflows required to run the business as well as interest income. If the cash flow is valued at the interest income rate for the cash flow, then value is the amount on the balance sheet. All of this implies that the correct treatment is to take operating cash out of both the free cash flow and the weighted average cost of capital. Once this is done, the operating cash can be added to the enterprise value in the same way as surplus cash.

The relationship between measurement of the weighted cost of capital and treatment of operating cash is demonstrated by the process of de-levering and re-levering the beta. The net debt rather than the gross debt is often used when computing the unlevered beta and cost of capital as illustrated in the excerpt below. If the cash lowers the amount of debt, the implicit cost of capital and the un-levered beta increase. For example, if companies like Apple and Microsoft are part of a sample and they each have a lot of cash on their balance sheet, the measured equity beta of each company understates the risk associated with free cash flow. If net debt is used in adjusting the cost of capital then the cost of capital increases and reflects the volatility associated with the underlying EBITDA. If the operating cash is used as well as the surplus cash then the treatment discussed above where operating cash flow is treated the same as surplus cash flow is correct.

WACC Analysis

CONFIDENTIAL

Company	Levered (1) Beta B_L	Net Debt	D/E	% Debt	Effective Tax Rate	Unlevered Beta B_U
ITC Holdings Corp.	0.92	$2,264	0.97	49.2%	38.1%	0.58
Cleco Corporation	0.75	1,161	0.81	44.8%	15.3%	0.44
UniSource Energy Corporation	0.77	1,838	1.87	65.1%	55.0%	0.42
ALLETE, Inc.	0.76	559	0.56	36.0%	34.3%	0.55
NorthWestern Corporation	0.82	855	0.98	49.4%	37.3%	0.51
MGE Energy, Inc.	0.71	365	0.43	30.3%	35.5%	0.55
CH Energy Group, Inc.	0.79	453	0.58	36.5%	37.6%	0.58
UIL Holdings Corporation	0.88	764	1.05	51.1%	41.8%	0.55
El Paso Electric Company	0.79	740	1.09	52.1%	32.8%	0.46
Empire District Electric Company	0.77	746	1.17	54.0%	32.5%	0.43
Unitil Corporation	0.54	325	1.45	59.1%	32.0%	0.27
Central Vermont Public Service Corporation	0.74	176	0.80	44.4%	39.6%	0.50
Florida Public Utilities Company	0.73	49	0.56	36.0%	35.0%	0.53
Average	**0.77**		**0.95**	**46.8%**	**35.9%**	**0.49**

Cost of Equity Build Up	
Unlevered Beta	0.49
Levered Beta	0.65
Risk Free Rate (Rf) (2)	3.6%
Market Risk Premium	5.0%
Cost of Equity	**6.9%**

Assumed Target Capital Structure % (4)		Pre-Tax Cost	After-Tax Cost	WACC Build-Up
Net Debt	32.4%	5.6%	3.9%	1.3%
Equity at Market Value	67.6%	6.9%	6.9%	4.6%
Total	100.0%			
Weighted Average Cost of Capital (WACC)				**5.9%**

Inputs	
Date	07/30/09
Beta Update	07/31/09
Debt Rates	07/30/09
t = Tax Rate	30.9%
MRP = Market Risk Premium	5.0%
Risk Free Rate	3.6%
Assumed Credit Spread	2.0%

WACC Sensitivity

Beta	% Debt 20.0%	27.4%	32.4%	37.4%	40.0%
0.39	5.5%	5.5%	5.5%	5.4%	5.4%
0.44	5.7%	5.7%	5.7%	5.7%	5.6%
0.49	6.0%	5.9%	5.9%	5.9%	5.9%
0.54	6.2%	6.2%	6.1%	6.1%	6.1%
0.59	6.4%	6.4%	6.4%	6.3%	6.3%

Formulas

Levered Beta (B_L)= Unlevered Beta (B_U) * (1+ D / E) * (1 - t)
Unlevered Beta (B_U)= Levered Beta (B_L) / (1+ D / E) * (1 - t)
Cost of Equity (Re) = Rf + Beta * MRP
WACC = ((D / (D + E) * Rd * (1 - t)) + (E / (D + E) * Re
Adjusted Beta = Unadjusted Beta * 0.67 + 1 * 0.33

In cases where debt is part of the capital structure, debt reduces the un-levered or asset beta as in the example above -- the observed equity beta is .95 while the asset beta is .49. For the single company being valued, re-levering with additional debt increases the equity beta and then reduces the cost of capital given the increased beta. Without taxes, these two effects would offset each other and the asset beta would drive the cost of capital. If there is surplus and operating cash instead of debt, the opposite occurs. Operating and surplus cash increases the asset beta relative to the observed equity beta and without taxes this increased asset beta is the risk driver of the cost of capital. This is principle of the proof in the prior paragraph. The free cash flow is computed independent of the effects of the operating cash and the cash is valued separately. Therefore, if the weighted average cost of capital is adjusted appropriately through adjusting the asset beta for both operating and surplus cash, the operating cash should be treated like surplus cash and not in analogous manner to accounts receivable.

The idea of isolating the cost of capital associated with operating cash flow does not only apply to operating and surplus cash. If a company has associated investments that are much more risky than the assets that create EBITDA, then the cost of capital applied to free cash flow should remove the effects of these risky investments. This is accomplished by removing the associated investments from the asset beta of comparable companies as operating cash was removed from the calculation. Similarly, if a company is financing itself with unfunded pensions instead of debt, the asset beta should be adjusted for this form of equivalent debt. You should be able to see the pattern. Every item that is classified on the financing side of the invested capital ledger should also be part of the process of adjusting the asset beta. The process of segregating the balance sheet for purposes of invested capital not only drives the return on investment, it also affects the enterprise value to equity value bridge and the weighted average cost capital.

Treatment of Derivative Assets and Liabilities Depends on How the Derivatives Affect EBITDA and Free Cash Flow

The fair value of derivative liabilities and assets recorded on the balance sheet must either be classified on the finance side or the net asset side of the invested capital ledger like any other asset or liability. A few years ago the value of derivative assets or liabilities such as swaps, options and forward contracts were not valued in financial statements before settlement of the contracts. These days the market value of derivatives is put on the balance sheet even though it did not arise from a cash outflow made by investors. To understand how derivatives should be treated in the invested capital calculation and in the bridge between enterprise value and equity value a minimal amount of accounting should be understood as was the case for deferred taxes. Derivatives can be accounted for using hedge treatment or fair value treatment. Derivatives that are classified as hedges do not have an effect on income until the contract is settled while derivatives under the fair value treatment affect profit any time the value changes. To illustrate the accounting and valuation effects of a derivative one can consider two simple cases. The first case is a futures contract that fixes the price of oil for an exploration company. Assume that the price is fixed at 150 while the current price of oil is 100 implying that the contract has a positive value. The second case is an interest rate swap that fixes interest rates at 4% in three years. In this case assume the current interest rate is 2% implying that the swap has a negative value and is classified as a liability. If hedge accounting is used for the oil futures contract, revenue and EBITDA is not recognised until the oil exploration company settles the contract in three years. For the intervening years, the value appears on the balance sheet as an asset and an account called accumulated other comprehensive income is also increased. If the company uses fair value treatment for the oil price forward contract, the EBITDA is increased when the value of the contract changes (in the current year), rather than when the contract is settled in three years. With the fair value treatment, accumulated other comprehensive income does not change when the value changes because equity is changed when profit changes. The same sort of treatment could occur for the interest rate swap, but there would be a liability instead of an asset and the loss would be below the EBITDA line in either the first year or the third year. The difference in accounting treatment affects the timing of income, but either way the change in the value of the derivative eventually shows up in profit.

Unlike other balance sheet items, the treatment of derivatives may differ for purposes of computing invested capital and for purposes of evaluating the bridge between enterprise value and equity value. Recall from the very beginning of the discussion of ROE and ROIC that invested capital is supposed to represent the amount of money that investors initially put into the business in order to generate EBITDA. For derivatives that are accounted for either using the hedge treatment or the fair value treatment, the balance sheet value does not represent investment that has been made by investors. Instead, the balance sheet value measures the change in the market value of the derivative over time. If the invested capital is to be measured, then the value of the derivatives should be removed from equity value and the derivatives should be put on the financing side of the ledger as they do not represent money that has been spent to generate EBITDA. Note that using this logic, any impairment or asset write-up should also be adjusted for purposes of computing invested capital.

The reason for not including derivatives on the net asset side of the ledger can demonstrated by thinking of the derivatives as taking a bet. If the company has made a good bet, then the ROIC increases. If the company has made a bad bet, the ROIC declines. Differences in the ROIC due to the accounting treatment of derivatives are simply a matter of timing. When the bet was originally made, there was no investment required to enable the bet. The denominator of the ROIC should not be affected by changes in the value of the derivative. The implication of all of this is that the equity balance on the balance sheet should be adjusted for the value of the derivative when either the ROE or the ROIC is computed.

Unlike classification of all of the other items discussed above, the classification of derivatives can be different for purposes of evaluating the bridge between enterprise value and equity value than in classifying invested capital. This is because the market value of derivatives can be used to compute the difference between the market value and the book value of items on the balance sheet. The general rule for classifying derivatives when computing the bridge between equity value and equity value is simple. If settlement of the derivative is already reflected in EBITDA and free cash flow, the value of the derivative is already in the enterprise value and including it again in the bridge between equity value and enterprise value would be double counting the item. On the other hand, if the derivative has not been valued as part of EBITDA and free cash flow, it should be part of the bridge. To demonstrate this idea return to the example of the oil forward contract and the interest rate swap introduced at the beginning of this section. If the 150 oil price from the forward contract is included in the projection of EBITDA, then the value of the derivative is already in the discounted free cash flow value. In the case of the interest rate swap, if debt is taken from the balance sheet, the value of the swap can be used to move the debt from book value to market value and the derivative should be included as part of the value of the debt rather than left out of the analysis. Similar arguments can be used for exchange rate hedges. As the WACC should use d ebt and equity market value, the derivatives that are included in the bridge between equity value and enterprise value should also be included in the WACC table.

Reconciliation of Invested Capital Items and Taking Confusion Treatment of Derivative Assets and Liabilities Depends on How the Derivatives Affect EBITDA and Free Cash Flow

Through application of the consistent principle that cash flows not included in EBITDA, free cash flow and enterprise value, the market value of debt has similar characteristics to the other items above. The cost of capital associated with the market value of the debt should be measured at the date of the debt valuation and be measured in the WACC so that the cost of capital associated with the enterprise value is not distorted. This means that if one believes in computing asset betas and then re-levering the betas (which is demonstrated to be inaccurate below) that the re-levered beta must be consistent with the market value of the net debt at the valuation date. For example, it is inappropriate to use a target debt to capital ratio that is inconsistent with the net debt used in the equity to enterprise value bridge. If for example, the debt actual value of the debt results in a debt to capital ratio of 70%, but the target debt to capital ratio is 40%, the valuation would be distorted through use of the target capital structure in the WACC and the re-levered beta, but use of the actual market value of debt in the bridge. The problem of inconsistent valuation is illustrated in the example below.

Distortions from Target Capital Structure		
Assumptions		
Unlevered Beta	0.8	
Target Debt to Capital	40%	
Actual Market Value of Debt to Capital	70%	
Risk Free Rate	4.50%	
Equity Market Risk Premium	5.00%	
Computed Cost of Capital		
Cost of Equity Using Target Debt to Capital	11.17%	
Cost of Equity Using Measured Debt to Capital	17.83%	
Theoretical WACC using Asset Beta	8.50%	
Current Values		
Equity Value	2,000.00	30%
Market Value of Debt	4,666.67	70%
Total Market Value of Enterprise	6,666.67	
Contining Cash Flow		
Assumed Perpetual Cash Flow	566.67	
Perpetual Debt Service at Risk Free Rate	210.00	
Perpetual Equity Cash Flow	356.67	
Implied Valuations		
Value of Equity using Acutal Debt Ratio	2,000.00	
Value of Equity using Target Debt to Capital	3,194.03	
Enterprise Value	6,666.67	
Less: Market Value of Debt	4,666.67	
Value of Equity	2,000.00	

Items that Have Little or No Value on the Balance Sheet that Should be Included in the Bridge between Equity Value and Enterprise Value

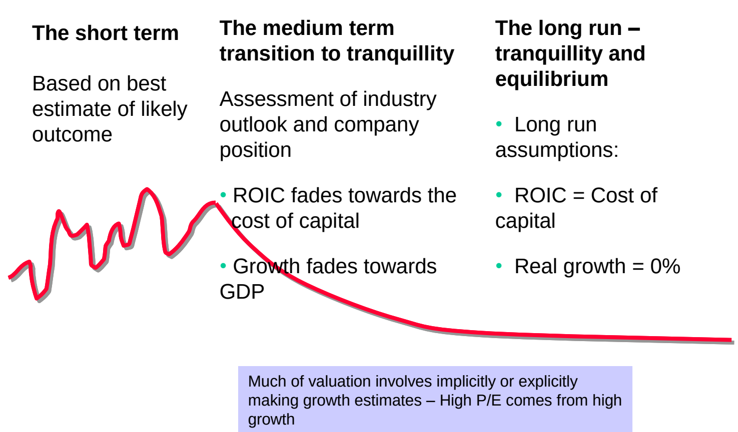
When discussing the discounted cash flow model, finance texts often describe the example of land that is held for building a future factory or a real estate development as something that should be included in the bridge between enterprise value and equity value. If the land is not currently earning income, but could be sold at a substantial sum, the additional amount should be included in the bridge between enterprise value and equity value. For example, suppose a parcel of land is currently earning nominal amounts for being used as farmland but that the land will be used in five years for development of a large commercial building. If the farm income is included in the free cash flow, then difference between the value that the land could be sold for and the present value of the farm land should be included in the bridge. If one takes this example to the extreme – say a hotel company buys land all over the world that may or may not be used in developing hotels, then the beta of the company should incorporate the risks associated with land speculation and the value of the land should be included as an element in the weighted average cost of capital calculation with a high beta. This adjustment to the WACC would probably never really be made, but it illustrates how to think through the problem. Because this example is used by textbooks it sometimes causes confusion in practical applications. For instance the value of land upon which a factory sits may could be argued to be an additional item that should be included in the bridge between equity value and enterprise value. Unless the factory is planned to be sold in a short period and the cash flow from the sale is not included in the flow, this adjustment is generally not appropriate.

Investments in land and discontinued assets that are not producing EBITDA should be deducted from the invested capital at the investment cost because debt and equity raised to finance these items does not generate EBITDA. The case of Apple Computers demonstrates both the idea of allocating items on the basis of the EBITDA line and the general concept of ROIC relative to ROE. In 2013 Apple had more than 100 billion of cash and long-term investments on it balance sheet, but the cash only generated about 1% in income. Apple's return on equity of about 34% is strongly affected by the cash on the balance sheet. If the cash is removed from the invested capital, then the return on investment that Apple is earning on its non-financial assets is about 65%. So if you are buying your I-phone and wondering about how much money you are generating for Apple investors, the measure of 65% tells you a lot more than the 34%.

Chapter 26: Terminal Value and Philosophy: Growth Rates Should Eventually Converge to Overall Economic Growth, But How and When

The necessity of computing terminal value in corporate models comes from the idea that, unlike humans, corporations are assumed to last indefinitely. This notion means that forecasts of items such as growth, rate of return and cost of capital on an indefinite basis cannot be avoided when valuing a company. Winston Churchill's comment that: "It is always wise to look ahead, but difficult to look further than you can see" summarises the fundamental problem when thinking about growth in a financial model. One cannot see further than a few years which means how can one make a reasonable forecast of growth, return an capital and risk on an infinite basis. Given this problem, the convention in valuation is to resort to a rather vague philosophical concept rather than to attempt to make a detailed forecast. Since valuation of a corporation requires some explicit or implicit assumption with respect to growth one can begin by eliminating unreasonable assumptions. It does not make sense to assume that growth rates can occur for long periods above the overall nominal growth rate in the economy because it is easy to demonstrate that this means the company will in the not too distant future take over the economy. If you assume that Apple can continue to grow at 40% while the overall economy is growing by 3%, then in about 30 years there would be nothing other than Apple products in the economy – no food, no clothes, no cars; just iphones, ipads and other Apple products (some may believe this could be possible). This is just due to the law of large numbers. On the other hand it is just as unreasonable to assume that every company will eventually simply fail and end up in bankruptcy. As products of a company reach the end of their life cycle or become obsolete, management obsessively uses its skills to develop new products and business lines in attempting to sustain high growth and profitability. Given the two extremes -- maintaining growth above the overall economy or simply dying – the philosophy of assuming a stable growth rate is a reasonable compromise in making valuations. While this philosophy of sometime realising stable growth rates can be defended relative to other possible methods, the date at which the transition from short-term to long-term growth begins and the length of the transition period is still completely arbitrary as is the assumption for the long-term growth rate of the economy.

To resolve problems with making unreasonable high growth rate assumptions, analysts who perform discounted cash flow analysis generally make a pessimistic assumption that growth in cash flow once a terminal period occurs will be limited to the projected rate of inflation. This means that companies will stabilize to a tranquil zero real growth rate in a period of somewhere between five and ten years, perhaps after a smooth transition period until the supposed tranquillity is obtained. While the assumption is commonly made, it is difficult to come up with any company that has reached this kind of tranquil nirvana or has managed such a transition to equilibrium. If this assumption were made for every company in the economy, meaning all companies would have no real growth in cash flow, then no companies would contribute to real economic growth and the world economy would stagnate in a never-ending recession. The typical assumptions derived from the philosophy that a company will stabilise to towards a zero real growth rate are illustrated on the graph below.



Given the well documented optimism of stock analysts, it may seem a little surprising that analysts, consultants, investment bankers and others who perform discounted cash flow analysis generally make an assumption that growth in cash flow once a terminal period occurs will be limited to the projected rate of inflation. Growth at the rate of inflation implies that there is no real growth in any company. While the assumption is commonly made, it is difficult to come up with any company -- or person for that matter -- that has reached this kind of tranquil nirvana or has managed such a transition to equilibrium. Further, if all companies somehow reach this kind of equilibrium where there is no real growth in cash flow, no companies would contribute to real economic growth and the world economy would stagnate in a never-ending recession.

When reviewing growth rate in revenues for individual companies over long time periods, one can find downward trends in growth because of the difficulty of achieving a high growth when you become really big, but not the sudden change to stable growth rates that is often assumed in the discounted cash flow model. For example, the growth rate of Microsoft has declined, but it did not happen in five years and it has not come all the way down to the overall rate of inflation. Similar examples can be found with many companies that have become large and successful (McDonalds continues to grow at 8%, Wallmart at 9% and so forth). When reviewing these large companies one should keep in mind that there is survivorship bias as smaller companies which have never grown or have failed are more difficult to acquire data. If you are valuing ABC Company, there is a chance that they will continue to grow like Samsung, and there is also a probability that they will decline to nothing as the case of Kodak. One can get into endless philosophical and economic arguments about growth rates, survivorship bias and reaching a period of stability. But when applying the DCF model, some explicit or implicit assumption is required and assuming a high rate of growth over an indefinite period is not reasonable. At the end of the day, there is no one single correct answer and it is not useful to get very emotional about the level of the growth rate. It is better to admit the growth rate is uncertain and the length of the period before which growth stabilises is also uncertain.

Mechanics of Computing Transition Periods using the Idea of Compound Growth Rates and Switch Variables

If you would like to make a model that has a transition period like the line shown in the graph above you can use a technique that applies switch variables introduced in Part 1 along with computing compound annual growth rates. To illustrate the mechanics of computing growth during the transition period pretend that you would like to assume growth of 15% for the first five years followed by a transition period of seven years and then a growth rate of 3%. The following step by step process can be used for developing growth rates with given short-term growth, a transition period and then a constant long-term growth rate:

Step 1: Set-up switches for the short-term period, the long-term period and the transition period

Begin the process by defining time period inputs for the short-term period and the transition period. The long-term period can then be calculated as the short-term period plus the transition period. For example, if the short-term period is five and the transition period is seven, the long-term period is twelve. Once the inputs are defined, enter the period number beginning with one and then add three rows for switch variables. The three switch variables all of which have values of TRUE or FALSE, have the following values:

- The first switch variable is simply a comparison of the period number with the definition of the short-term as: period <= short-term period.
- For the second row of switches, define the long-term period as: period > long-term period (where he long term period was defined as the short-term period plus the transition period).
- The transition period can be simply defined as the equivalence of the short-term period and the long-term period. This is because during the short-term period and the long-term period there is

one TRUE and one FALSE while in transition period there are two values of FALSE in each column. Because of this, the transition period can be simply defined as:

Transition Period = (Short-term Period = Long-term Period)

Step 2: Compute compound growth rates for interpolation in the transition period

During the transition period the various different variables gradually move from the level defined at the end of the short-term period to the long-run stable amount. In computing the value on a period by period basis in the transition period, a compound growth rate can be used to interpolate different values. Once the growth rate is computed, the value during the transition period can be established using the following formula:

Value = Value x (1 + growth rate)

In computing the growth rate, a standard compound annual growth rate equation can be applied using the long-term value and the short-term value. When applying the formula, the number of periods that you should use is the number of transition years plus one.

Growth Rate = (Long-term value/Short-term value) ^(1/(transition years+1))

To see why you must add one in the above formula, consider a simple example where the transition period is only one year. If the transition factor were computed without adding one, the growth rate the ratio of the long term amount to the short term amount. If this growth were multiplied by the short-term value, the transition year would contain the long term amount and not something in-between which is what is supposed to be. On the other hand, when the transition factor is computed through adding a year to the transition period, then the transition factor correctly measures the CAGR because the transition adds another year to the process. Using the example with a short-term value of 10 and a long-term value of 15 along with a one year transition period, the transition factor would be:

Transition Factor = (Long-term/Short-term) ^(1/(transition years+1) = (15/10)^(1/2) = 1.225

Step 3: Compute compound growth rates for interpolation in the transition period

Given different TRUE and FALSE values for the switches, the transition factors and the long and short-term parameters, the period by period values for growth, return and other factor can be computed using the following formula if the growth rate method for transition is used:

Annual Value = Short-term Value x Short-term Switch +
Long-term Value x Long-term Switch +
Last Year Value x Growth Rate x Transition Switch

Transition Factors											
Inflation Transition	1.20										
Risk Premium Transition	0.87										
Return above COC Transition	0.83										
Growth Rate Transition	0.92										
Model											
Period	0	1	2	3	4	5	6	7	8	9	10
Short-term Switch		TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
Long-term Switch		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Transition Switch		FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE
Inflation Rate		1.00%	1.00%	1.00%	1.00%	1.00%	1.20%	1.44%	1.73%	2.08%	2.50%
Real Interest Rate		1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Nominal Interest Rate		2.50%	2.50%	2.50%	2.50%	2.50%	2.70%	2.94%	3.23%	3.58%	4.00%
Risk Premium		4.00%	4.00%	4.00%	4.00%	4.00%	3.48%	3.03%	2.64%	2.30%	2.00%
Total Cost of Capital		6.50%	6.50%	6.50%	6.50%	6.50%	6.18%	5.97%	5.87%	5.88%	6.00%
Risk Premium		5.00%	5.00%	5.00%	5.00%	5.00%	4.16%	3.47%	2.89%	2.40%	2.00%

Mechanics of Computing Explicit Cash Flow and Terminal Value in a Flexible way with Different Starting and Ending Points

In subsequent chapters, conceptual problems associated with computing terminal value using different approaches are discussed in detail. Before considering the numerous theoretical challenges arising from different growth and return assumptions, a couple of mechanical issues associated with computing the discounted cash flow in an annual model are addressed. To illustrate timing and discounting issues, this section assumes that the value of a company after reaching the stable period is given by the standard continuing growth model:

TV = [Free Cash Flow in Terminal Period x (1+terminal growth)]/(WACC – terminal growth)

This formula was previously applied in demonstrating how to prove different valuation concepts. The reason the growth rate is in the numerator of the formula is due to the mathematics of discounting cash flows. This comes from the fact that the value of a cash flow in perpetuity is the next period cash flow – not the current period cash flow -- divided by the discount rate.

If an annual model is used for valuation and the standard NPV formula is applied then you are implicitly assuming that the cash flows all occur at the end of the year. This assumption is unrealistic and can result in an error as not all revenues suddenly occur on the last day of December of each year and each valuation does no happen on the first of January of the year. Cash flows actually occur in small increments – day by day or hour by hour – and if your model applies annual periods, a reasonable approximation of this is to assume that cash flows occur in the middle of the year. However, if the company were to be sold and valued at the end of some holding period, the cash flow occurs at a single point in time rather than over small increments. If realistic timing assumptions are in a valuation model rather than end of year assumptions, the value of the company is increased.

To correctly incorporate timing of cash flows in a model it may be helpful to draw a time line as shown in the diagram below. Drawing a time line demonstrates that the discount factor should be different for the terminal value and the periodic cash flows which requires a couple of extra lines of code and prevents you from using the nice little TRUE/FALSE switch were the discounting can easily be started in flexible periods. In addition, you have to be careful in applying the growth rate for the terminal value formula as the growth should be based on the cash flow at the end of the year and not at the beginning of the year. The time line diagram below illustrates that correctly discounting using than mid year discounting for cash flows and end of period discounting for the terminal period cash flows increases the value by almost 3% relative to the value that is computed from end of year discounting. This is not very dramatic, but there is no reason to make incorrect calculations in a model. There are a couple of complexities in the diagram below relating to how the terminal value is computed. As the holding period is four years and the four years of cash flow are received, the terminal value should be computed at the end of the fourth year

rather than in the middle of the year for the operating cash flow. This necessitates a second discount factor that does not include the half year assumption.

WACC	10%					
Growth Rate	5%				Dec Cash Flow	118.66
	100	105	110.25	115.76	CF x 1+g	124.59
					Value of TV	2,491.79
	Value at 1 Jan					
	Cash at 1 July		Cash at 1 July			
				Sell at 31 Dec		
Discount Period	0.5	1.5	2.5	3.5		
CF Discount Factor	0.95	0.87	0.79	0.72		
Terminal Period				4.0		
TV Discount Factor				0.68		
Value of Cash Flow	95.35	91.01	86.88	1,784.85		
Sum	2,058.09					
EOY Discounting	100.00	105.00	110.25	2,546.78		
NPV	2,000.00					
Percent Difference	2.90%					

The step by step approach for correctly reflecting the timing of cash flows includes computing a different terminal cash flow than the cash flow of the final period, computing discount factors that use a half year convention, calculating a different discount factor for the terminal year, and using the SUMPRODUCT function for computing the net present value. Some of the subtleties in these calculations are listed in the step by step analysis below.

Step 1: Compute the discount factor for continuing cash flow and for terminal cash flow

The first step in the process is to use the terminal switch and valuation period switches discussed in above in the context of proving various valuation concepts to develop period counters. This approach works with changing discount rates that may arise if there are different inflation rates or interest tax shields in the model (the discount should not theoretically change if the debt to capital changes and there is no tax shield on the interest). It also works when the valuation period changes and the exit period changes. Discount factors are computed through creating an index (much like the inflation rate) that will be the denominator of the discounted cash flow. To illustrate this simple idea consider a two period example with a constant discount rate where discount factor = (1+rate) x (1+rate) = $(1+rate)^2$ and PV = $CF_2/(1+rate)^2$ which is the same as CF_2/discount factor.

Discount Factor = Prior Discount Factor x (1 + Discount Rate x Valuation Period Switch)

Computing the half year discount rate is a bit more involved where one can create a row for the discount rate in the prior year and the discount rate in the current year. The discount rate in the prior year should be switched to zero before the valuation period so the weighted rate below is ½ of the discount rate in the first period.

Discount Rate in Prior Period = Discount $Rate_{t-1}$ x Valuation $Switch_{t-1}$

Weighted Rate = .5 x Discount Rate + .5 x Prior Year Rate

½ Yr Discount Factor = Prior ½ Yr Discount Factor x (1 + Weighted Rate) x Valuation Switch

Step 2: Compute the terminal cash flow adjusted for growth rate

Using the time line diagram above, the terminal cash flow should have an extra ½ year of growth after witch the terminal growth rate should be applied. In modelling this, assume the last year of growth is called last year growth and the terminal growth is terminal growth. Assuming the terminal growth begins after the final period, the formula for cash flow in the terminal period and the terminal value are given by the following two formulas:

Terminal Cash Flow for Valuation = Terminal Cash Flow x (1+last year growth x .5)

Enterprise Value = Terminal Cash Flow x (1+terminal growth)/(WACC-terminal growth)

Step 3: Compute the value of continuing cash flow and terminal cash flow

Once the timing switches have been established and the discount rates have been established, the SUMPRODUCT can be used to compute the present value of cash flow. This can be done through dividing the cash flow by the discount factors inside the SUMPRODUCT function and also multiplying the cash flows by the valuation switch as illustrated below:

PV of Explicit Cash Flow = SUMPRODUCT(Cash Flow x Valuation Switch / ½ Year Discount Factor)

PV of Terminal Cash Flow = SUMPRODUCT(Terminal Cash Flow x Terminal Switch/Discount Factor)

Assumptions

Valuation Year	4		
Terminal Year	10		
Discount Rate	Period	Rate	Inflation
	1	4%	2%
	5	4%	2%
	7	6%	4%
	9	5%	3%
Middle Period Cash Flow in Zero	100		
Terminal Growth	3.000%		

Model

		1	2	3	4	5	6	7	8	9	10	11	12
Valuation Year		FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Valuation Period		FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Terminal Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
Inflation Rate		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	4.00%	4.00%	3.00%	3.00%	3.00%	3.00%
Index	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.17	1.22	1.25	1.29	1.33	1.37
Middle Period Cash Flow	100.00	102.00	104.04	106.12	108.24	110.41	112.62	117.12	121.81	125.46	129.22	133.10	137.09
Discount Factor		0.00%	0.00%	0.00%	4.00%	4.00%	4.00%	6.00%	6.00%	5.00%	5.00%	0.00%	0.00%
Full Year Discount Factor	1.000	1.000	1.000	1.000	1.040	1.082	1.125	1.192	1.264	1.327	1.393	1.393	1.393
Prior Year Discount Factor		0.00%	0.00%	0.00%	0.00%	4.00%	4.00%	4.00%	6.00%	6.00%	5.00%	5.00%	0.00%
Weighed Rate		0.00%	0.00%	0.00%	2.00%	4.00%	4.00%	5.00%	6.00%	5.50%	5.00%	2.50%	0.00%
1/2 Year Discount Factor	1.000	1.000	1.000	1.000	1.020	1.061	1.103	1.158	1.228	1.295	1.360	1.360	1.360
Final Period Cash Flow		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,754.85	0.00	0.00
Cash Flow in Explicit Period	704.44												
Cash Flow in Terminal Period	4,847.58												

Alternative Ways Stable Growth Can Occur and Implicit Effects on Value

While the general subject of terminal growth rate is often discussed in the context of valuation analysis, the way in which growth changes is rarely part of the discussion. When the growth rate of a company slows down, there are various different ways the growth can slow ranging from declines in sales where profit is maintained, to decreases in profit where expenses and capital expenditures are maintained at the levels that existed before growth fell off. Three different ways growth can change in terms of sales, capital expenditures and ROIC are the following:

1. Growth in revenues can slow but ROIC remains constant. This is probably the assumption that most people think of when they are applying long-term stable growth assumptions. Keeping the ROIC constant while sales slow down implies capital expenditures and working capital decline in the first year of the transition and then grow at the same rate as the revenues. If the capital expenditures are held constant, the valuation does not produce a valuation consistent with this assumption.

2. Growth can stabilise at a slower level when as capital expenditure investments and working capital investments stop growing. Many would assume that this assumption is equivalent to the assumption that sales growth slows, but it is not. If capital expenditures slow and the return remains the same, then the investment still reflects prior capital expenditures and income still depends on the previous investment. Where return is constant, growth in sales to eventually slow, but the change in the growth in sales occurs with a lag relative to the growth in capital expenditures. The valuation is higher using the assumption that capital expenditures slow down than if the assumption is made that sales slow and return stays the same.

3. Growth in both revenues and capital expenditures could stabilise at the same time which is the assumption many people may think is reasonable. But when this assumption is made, the return on investment does not remain constant. When EBITDA declines relative to what it would be with higher growth because of declining sales growth (assuming that the EBIBTA margin remains constant) but the investment does not decline in a commensurate manner, then the only thing left is for the return on investment to decline. Through assuming that sales and returns decline without assuming that capital expenditures fall off to maintain the return, the value declines.

These differences in the way sales growth changes seem technical, but the next few chapters work through how subtle differences like this affect value in constructing a model.

Chapter 29: The Importance of Normalising Cash Flows in the Terminal Year to Assure that Cash Flows are Consistent with Stable Growth Rates in the Relatively Simple Case of Working Capital

The next few chapters consider various adjustments to terminal cash flow and to terminal value formulas that should be included in a model to accurately measure value when growth rates move from short-term assumptions to long-term stable rates. Modelling issues in which the effects of changing growth come into play include normalising cash flow in the terminal period, computing terminal value using the value driver formula and deriving implied P/E and EV/EBITDA ratios. For all of these issues the changing growth rate affects the modelling of investments in working capital, capital expenditures, depreciation and deferred tax. To understand both the valuation theory and the modelling mechanics with respect to changes in growth it is convenient to begin the discussion with working capital and then proceed to capital expenditures and deferred taxes. Once the modelling working capital is established, you will have a stepping stone to understand the more difficult issues associated with depreciation, capital expenditures and deferred taxes. Analysis of capital expenditures and depreciation is more complex than working capital because depreciation is influenced by historic expenditures made over the prior life cycle of plant. In the case of working capital, the effects of a change in growth are immediate and there is no necessity to evaluate an entire life cycle of plant.

When Adjusting Growth Rates of Revenues a Host or other Things Change Including Working Capital Investment, Capital Expenditures, Depreciation, Deferred Taxes and Income Taxes

When the growth rate in revenue changes to the lower stable terminal growth rate, analysts sometimes assume that other items of cash flow including working capital changes and capital expenditures grow from the previous level which is driven by growth rates during the explicit period. The assumption that capital investment and working capital remain at levels that were consistent with short-term growth but that prospective stable EBITDA has a different growth rate creates a number of inconsistencies that can distort valuation. If the revenues increase at a slower rate, then the rate of EBITDA also slows which means that less working capital investment and capital expenditures are necessary to support the slower EBITDA growth. In addition, with lower capital expenditures, there will be less deferred taxes and the ratio of depreciation expense relative to the EBITDA will change. Accurately modelling the manner in which investment changes when growth rate changes is an essential part of the valuation process. From the perspective of the free cash formula where free cash flow equals EBITDA less working capital changes less capital expenditures less operating tax less change in deferred tax, each of the items that are subtracted from EBITDA should be normalised to be consistent with the terminal growth rate.

The idea of using a terminal growth rate in valuation and modelling generally implies a stable equilibrium that is lower than the growth rate during the explicit cash flow period. In creating a corporate model the normal assumption is that when revenues and income changes, the working capital changes in direct linear manner with revenues. Most of the time accounts receivable are modelled as a percent of revenues and operating costs are also expressed as a percent of revenue. This implies that accounts payable and inventories also move in direct proportion to revenues. If the growth rate in revenues slows, then the growth of working capital will also slow. The problem occurs because in the last year of the explicit forecast period -- named the terminal year -- the revenue growth does not reflect the new terminal growth rate. But the working capital investment in future will decline if the terminal growth rate is lower than the growth rate in the terminal period. The decline in revenues from the lower terminal growth rate is reflected in the valuation because the cash flow implicitly grows at the terminal growth rate when the formula TV = Final Year Cash Flow x (1+terminal growth)/(WACC – terminal growth) is applied. Nothing in the formula adjusts for the prospective lower investment in working capital. A downward bias arises because working capital changes in the final year cash flow are not consistent with working capital changes that would be present with a lower terminal growth rate.

To illustrate this problem pretend that revenue growth is 50% in the final year resulting in a revenue value of 150 for cash flow at the end of the year. Also pretend that the terminal growth is assumed to be 3% and the company only has revenues and accounts receivable. Cash flow in the final year cash flow would subtract a large number for investment in working capital that is derived from the projected 50% growth. Assume the increase in working capital is in terminal year is 50. If the standard perpetuity formula is applied, the last year cash flow of revenues less working capital investment of 100 is implicitly assumed to grow at 3%. This means the 150 revenues are assumed to grow at 3% and also the working capital investment of 50 is assumed to grow at 3%. If revenues only grow by 3% the working capital investment will be much less and the starting cash flow should be higher. To solve this problem one can create a separate calculation for the terminal year cash flow that includes normalised working capital investment.

Developing a Simple Equation for the Stable Ratio of Working Capital Change to Normalise Cash Flow after the Explicit Forecast Period

Unlike the case of capital expenditures, a relatively simple formula can be used to adjust the terminal cash flow to normalise working capital changes. If assumptions for the days accounts receivable, days accounts payable, days of inventory and the operating margin are constant, then the level of working capital to EBITDA will also be constant. With the constant ratio of working capital to EBITDA, the working capital changes can be generally be expressed as:

Working Capital Changes = Working Capital/EBITDA x EBITDA x growth

This can be demonstrated by working through the derivation of working capital as follows:

$$\text{Working Capital}_{t-1} = \text{Working Capital/EBITDA} \times \text{EBITDA}_{t-1}$$

and,

$$\text{Working Capital}_{t} = \text{Working Capital/EBITDA} \times \text{EBITDA}_{t-1} \times (1 + \text{growth})$$

Implying:

$$\text{Working Capital Change} = \text{Working Capital/EBITDA} \times (\text{EBITDA}_{t-1} \times (1+\text{growth}) - \text{EBITDA}_{t-1})$$

or,

$$\text{Working Capital Change} = \text{Working Capital/EBITDA} \times \text{EBITDA}_{t-1} \times \text{growth}$$

or,

$$\text{Working Capital Change} = \text{Working Capital/EBITDA} \times \text{EBITDA}_{t} \times \text{growth}/(1+\text{growth})$$

When implementing this formula the free cash flow for purposes of computing terminal value in the terminal year is the EBITDA from the terminal year less the working capital change from the above formula rather than the working capital computed from explicit period cash flow. To demonstrate why it is important to incorporate stable investment ratios in a valuation analysis one can create a long-term proof in a similar manner as the proof that was created in the earlier chapter where the treatment of accounts payable was demonstrated. In creating a simple example, you can make one scenario where the model continues for a couple of hundred years and the value is derived from the long-term cash flow. Next, you can simulate valuation in a case with no adjustment for normalising working capital investment and show that the value is not correct. Finally you create a case that normalises working capital and demonstrate that this third case with the normalised cash flow produces the same value as the case that simulated cash flow for hundreds of years.

The following few steps demonstrate how to develop a model that contains such as a proof. An excerpt of the spreadsheet proof using these steps is shown below.

Step 1: Create a long-term model that includes growth rates which change from a high rate to a low terminal growth rate using a short-term switch and a long-term switch. Compute revenues, accounts receivable levels and the change in working capital using the changing growth rates. Calculate free cash flow from revenues less working capital changes and discount free cash flow over the entire period to compute the true value.

Step 2: Add switches for the holding period and the terminal period and compute value from the holding period cash flow plus the terminal value. Compute the holding period value using the holding period switch and the terminal value using the terminal value switch through applying the perpetuity formula to the terminal period cash flow. The value computed from this method produces a different number than the true value created from the analysis that extends for the long period in step 1.

Step 3: Use the same switches from step 2 but add a calculation for the stable working capital change using the formula working capital change = working capital/EBITDA x growth/(1+growth) to normalise cash flow in the terminal period. When the present value of the terminal value is recomputed, the total value is the same as the value in step 1.

True Value										
Period	0	1	2	3	4	5	6	7	8	9
Explicit Period		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE
Long-term Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE
Terminal Period		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
Growth Rate		25%	25%	25%	25%	25%	25%	25%	2%	2%
Revenues	100.00	125.00	156.25	195.31	244.14	305.18	381.47	476.84	486.37	496.10
Operating Costs	90.00	112.50	140.63	175.78	219.73	274.66	343.32	429.15	437.74	446.49
EBITDA	10.00	12.50	15.63	19.53	24.41	30.52	38.15	47.68	48.64	49.61
AR Level	16.44	20.55	25.68	32.11	40.13	50.17	62.71	78.38	79.95	81.55
AP Level	2.47	3.08	3.85	4.82	6.02	7.52	9.41	11.76	11.99	12.23
Working Capital	13.97	17.47	21.83	27.29	34.11	42.64	53.30	66.63	67.96	69.32
Change in WC		3.49	4.37	5.46	6.82	8.53	10.66	13.33	1.33	1.36
WC to EBITDA Ratio	140%	140%	140%	140%	140%	140%	140%	140%	140%	140%
Free Cash Flow										
EBITDA		12.50	15.63	19.53	24.41	30.52	38.15	47.68	48.64	49.61
Less: Change in WC		3.49	4.37	5.46	6.82	8.53	10.66	13.33	1.33	1.36
Free Cash Flow to Firm		9.01	11.26	14.07	17.59	21.99	27.49	34.36	47.30	48.25
NPV of FCFF	$390.32									
Value from TV without Stable Ratio Adjustment										
FCFF Explicit		9.01	11.26	14.07	17.59	21.99	27.49	34.36	0.00	0.00
NPV of FCFF Explicit	$86.88									
PV of TV	$224.80	0.00	0.00	0.00	0.00	0.00	0.00	438.07	0.00	0.00
NPV of FCFF (Explicit + TV)	**$311.68**									
Stable Ratio										
Stable Ratio of WC Change to EBITDA from Terminal Growth	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Stable Level of WC Change	0.27	0.34	0.43	0.54	0.67	0.84	1.05	1.31	1.33	1.36
WC Change in FCFF		3.49	4.37	5.46	6.82	8.53	10.66	1.31	1.33	1.36
FCFF with Stable WC Change		9.01	11.26	14.07	17.59	21.99	27.49	46.38	47.30	48.25
PV of TV	$303.44	0.00	0.00	0.00	0.00	0.00	0.00	591.31	0.00	0.00
NPV of FCFF (Explicit + TV)	$390.32									

Mechanics of Incorporating Stable Working Capital Ratios and Other Stable Ratios in a Corporate Model

Once the formula for stable ratio of working capital changes relative to growth and EBITDA has been established, the normalised working capital should be entered into a corporate model in transparent and flexible manner. The normalised cash flow calculation should work with different terminal time period assumptions, with different working capital assumptions, with different stable growth rates and with different EBITDA levels that derive from explicit period assumptions. In structuring a corporate model to include these various items, effective presentation may be the most essential thing to do. A few ideas in presenting normalised cash flow include:

- You can create an input variable that is TRUE or FALSE which is used to apply the normalised or un-adjusted cash flows in computing the terminal value.

- Include rows that show the EBITDA, working capital and the ratio of EBITDA/working capital and the terminal growth rate that are drivers for the stable ratio calculation.

- Add a separate line for the normalised working capital change that comes from the formula discussed in this section.

- Compute normalised cash flow separately from cash flow over the holding period that can be discounted at a different discount factor from discounting the cash flow over the explicit period as discussed in discounting using a ½ year convention above.

Timeline	Custom Case		2013	2014	2015	2016	2017	2018	2019
Historic timeline switch	13		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Explicit period switch	8	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Valuation year	1		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Closing Balance Sheet for valuation	1		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Terminal value switch	1		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
Normalised Cash Flow Analysis									
Apply Normalised Ratios			FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
EBITDA - Midyear			366,698	375,245	384,006	407,467	471,058	499,562	529,911
Growth Rate in EBITDA			14.16%	2.33%	2.33%	6.11%	15.61%	6.05%	6.08%
Working Capital			150,770	161,414	172,626	183,183	194,246	205,838	217,984
Working Capital to EBITDA			41.12%	43.02%	44.95%	44.96%	41.24%	41.20%	41.14%
Terminal Growth		2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Stable WC Change as Percent of EBITDA			0.81%	0.84%	0.88%	0.88%	0.81%	0.81%	0.81%
Stable WC Change			2,956.27	3,164.99	3,384.82	3,591.81	3,808.74	4,036.04	4,274.19
Normalised Cash Flow inTerminal Period									
EBITDA			-	-	-	-	-	-	529,910.67
Less: Stabalised Working Capital			-	-	-	-	-	-	4,274.19
Less: EBIT x Tax from Levelised Depreciation									
Less: Levelised Stable Capital Expenditures									
Add: Levelised Stable Deferred Taxes									
Normalised Cash Flow in Terminal Period before Growh Adjustment			-	-	-	-	-	-	525,636.47
Normalised Cash Flow Adjusted for Added 1/2 Growth			-	-	-	-	-	-	541,602.86
Discount Rate for Terminal Value and Explicit Period									
Discount Rate		8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Discount Index for Terminal Value		1.00	1.17	1.26	1.36	1.47	1.59	1.71	1.85
Prior Discount Rate			8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Weighted Discount Rate			8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Discount Rate for Explicit Cash Flows		1.00	1.12	1.21	1.31	1.41	1.53	1.65	1.78

The section of the above titled "Normalised Cash Flow in Terminal Period" demonstrates that you should think about each of free cash flow line items when normalising cash flow. The normalised EBITDA should be consistent with a sustainable ROIC computed using all of the techniques discussed above. If the ROIC in the terminal period is not consistent with levels that can be sustained, the valuation will not be reasonable. Levelized depreciation expense used in computing taxes, levelized stable capital expenditures and levelized stable deferred taxes are described in subsequent chapters.

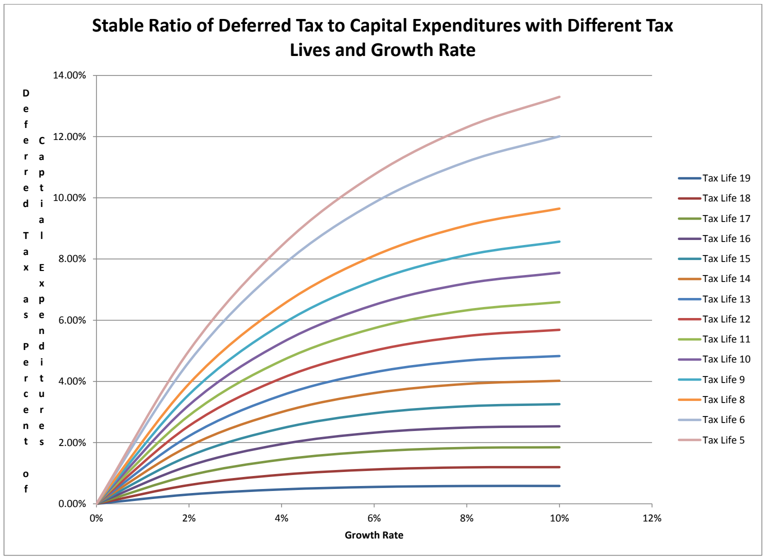
Chapter 30: Understanding the Relationship between Growth, Capital Expenditures and Depreciation as Background in Deriving Stable Ratios, Implied Growth Rates from Depreciation, Stable Ratios in Terminal Year, and Implied EV/EBIDA Ratios

If you could come up with formulas for depreciation, capital expenditures and depreciation In the above While the approach is straightforward for working capital changes, application is more complex in the case of stable ratios of capital expenditures to depreciation because of lag in adjusting ratios to the stable ratios after a change. The issue cannot be resolved in a simple way and involves the complications discussed below. Given all of the problems with application of stable ratios, the issue simply demonstrates further problems with the terminal growth rate method. A similar problem arises with the value driver formula where the stable level of depreciation in the terminal period NOPLAT exists:

- The capital expenditure to depreciation gradually declines
- The ratio of depreciation to EBITDA changes
- The stable level of depreciation affects EBIT and operating taxes
- The level of deferred taxes has similar issues to the capital expenditures and depreciation

One can imagine moving from one platform to another platform. In the case of working capital, the relationship between working capital investment and growth the transition is immediate. In the case of capital expenditures, depreciation and deferred taxes the transition can take a long time – in theory it will take an entire life cycle of plant.

Using Switches and Ratios to Compute Normalised Cash Flow in the Terminal Period



In computing cash flow, one could include the change in deferred tax directly in the free cash flow. Through including the deferred tax as an addition to cash flow, taxes in the free cash flow calculation reflect actual taxes paid. Further, when computing the terminal value in the stable period, the stable ratio of deferred tax to capital expenditure can be used. Through modeling deferred taxes directly in the cash flow including the terminal value, the deferred taxes are added to the enterprise value rather than being subtracted as part of the bridge between enterprise value and equity value. It would be incorrect to reduce the enterprise value that is already understated because it does not incorporate the on-going benefit of tax depreciation expense relative to book depreciation expense.

Deferred taxes arise for many other reasons than the difference between book and tax depreciation. Other examples include net operating loss carry forwards and deferred taxes arising from an acquisition where a tax free exchange is used for tax purposes. The reason deferred taxes arise from an acquisition is because write-ups in plant and intangible assets increase depreciation and amortization for book purposes without affecting tax depreciation. This increases the deferred tax liability because tax depreciation is less than book depreciation suggesting an increased liability exists. As intangible assets are amortized and increased plant balances are written-off the deferred tax change can be a negative number. In reflecting the effects of an acquisition in discounted cash flow as well as net operating loss, the change in deferred tax should be carefully modeled as part of cash flow. Similarly, if deferred taxes arise from a net operating loss carry forward (creating a deferred tax asset rather than a liability) then the deferred tax should also be included in free cash flow.

Chapter 31: Developing a Picture of Past Growth Rates from the Relative Level of Accumulated Depreciation and the Depreciation Expenses Relative to Net Plant

Future growth assumptions are easy. When working with depreciation, deferred taxes and capital expenditures need capital expenditures to find the retirements. Idea that depreciation gives picture of future – levelises out the vagaries in capital expenditures. If no historic growth and no future growth this would work well.

Chapter 32: Computing the Stable Ratio of Capital Expenditures to Depreciation and Depreciation Expense to Net Plant when Growth Rates Change

Depends on whether assume growth in capital expenditures, growth in revenues or changes in ROIC

The general question of how to compute capital expenditures in the DCF model is important in valuation, particularly in the terminal period. Some level of capital expenditures is needed to generate the EBITDA consistent with the growth rate. The amount of capital expenditures required to generate future growth depends on the assumed return on investment as well as the lifetime of capital expenditures and the growth rate. If capital expenditures in the past few years have been relatively low and one assumes that the future capital expenditures will be consistent with the past, then the EBITDA may not be able to grow. On the other hand, if the capital expenditures have been high and they are assumed to continue, the EBITDA growth should be much higher. To understand the relationship between capital expenditures and depreciation, consider a case where a company does not grow in nominal terms. Here, the depreciation expense covers the amount of money that is required to replace assets and the capital expenditures equal the depreciation. If a company is growing, then the capital expenditures must be greater than the depreciation expense to cover both the replacement of assets and increases due to growth. This occurs even if the growth is only nominal growth resulting from inflation as the depreciation expense measures past expenditures and the capital expenditures are expressed in current currency.

To rectify the problem of assuming capital expenditures that are far too low or far too high in relation to EBITDA, analysts sometimes simply assume that a level of capital expenditures equal to depreciation will sustain the EBITDA growth. This means that in the terminal year, one can compute the capital expenditures directly from the depreciation expense. While this may seem to be too simple of a rule of thumb, it does have some logic. There are however a few problems with this method. First, if inflation and growth has occurred in the past, the depreciation expense can dramatically understate the required replacement capital expenditures because depreciation by definition lags the capital expenditure. Second, the timing of retirements of existing capital can affect the future requirements.

Using the notion that the growth requires a ratio of capital expenditures that is above one, the formula for prospective growth in assets can be expressed as follows:

Growth = Depreciation Rate on Net Plant x (Capital Expenditures/Depreciation – 1)

This formula is analogous to the growth rate formula for earnings that is driven by the retention rate. As with the retention rate formula, it is useful to re-arrange the formula and compute the ratio of capital expenditures to depreciation as a function of the depreciation rate and the growth rate. (Note that the depreciation rate is 1/life of the assets which means that the capital expenditure to depreciation is a function of the growth rate and the life of the assets):

Capital Expenditures/Depreciation = Growth/Net Depreciation Rate + 1

This formula implies that if the growth rate is zero, then the ratio of capital expenditures to depreciation is equal to unity. The longer the life, the higher the required capital expenditures to support growth as depreciation is relatively low because it includes older assets. The problem with the above analysis is that the net depreciation rate depends on the growth rate. If the growth rate is very high, the depreciation on net plant approaches the depreciation rate on gross plant, but if the growth rate is low, the depreciation rate on net plant is higher than the depreciation rate on net plant.

To compute the ratio of depreciation to net plant and the stable ratio of capital expenditures to depreciation that is not 100% as sometimes assumed in models because when assets grow, a simple life cycle model can be developed. The simple model works through the balance of investment including

additions driven by growth and retirements that are a function of the asset life. The model can be extended indefinitely, but the ratio will stabilize at the end of the investment life. The example below shows a case where the ratio of capital expenditures to depreciation stabilizes at 122% rather than 100%.

When computing the ratio of capital expenditures to depreciation, one must first develop an assumption with respect to the growth of invested capital in plant and equipment. The ratio of capital expenditure to depreciation in perpetuity can computed once the growth rate in capital expenditures is input and retirements are computed from the depreciation life. Unfortunately, the calculations require some kind of assumption with respect to retirements of existing assets. (A simple assumption from depreciation rates can be made if a priori information is known.)

To model the future retirements, the first thing to note is that the retirements do not start until after the life of the plant. The first part of the formula should therefore be an IF statement involving the whether the year is greater than the life of the plant – before this year there are no retirements related to the capital expenditures. When the year is greater than the lifetime, then the retirements should begin. The retirements should look backward from the current year by the length of the life of the plant. This can be accomplished using the following formula:

Prospective Retirements = IF(Year > Asset Life, OFFSET(current cell,-1,-Asset Life))

With the investment balance computed, the depreciation expense can be computed. As with calculation of the net income in the P/E calculation above, the opening balance should be the basis of computing the depreciation. Once the depreciation is computed, the accumulated depreciation can be tabulated given the beginning balance of the accumulated depreciation. Then, the net investment balance is the gross investment balance less the accumulated depreciation. As with the stable ratio of capital expenditures to depreciation, other stable ratios include the ratio of depreciation to net plant, the ratio of capital expenditures to net plant and the ratio of capital expenditures to EBITDA.

Model												
Period	0	1	2	3	4	5	6	7	8	9	10	11
Growth Rates												
Real Growth Rate		3.00%	3.00%	3.00%	3.00%	3.00%	2.77%	2.55%	2.35%	2.17%	2.00%	2.00%
Nominal Growth Rate		4.03%	4.03%	4.03%	4.03%	4.03%	4.00%	4.03%	4.13%	4.30%	4.55%	4.55%
Investment Balance												
Gross Investment from Growth Rates	1,500.0	1,560.5	1,623.3	1,688.8	1,756.8	1,827.6	1,900.7	1,977.3	2,058.9	2,147.4	2,245.1	2,347.2
Implied Capital Expenditures		60.5	62.9	65.4	68.1	70.8	73.1	76.6	81.6	88.4	97.7	102.2
Depreciation Rate		6.67%	6.67%	6.67%	6.67%	6.67%	6.67%	6.67%	6.67%	6.67%	6.67%	6.67%
Depreciation Expense		66.7	66.3	66.0	66.0	66.1	66.4	66.9	67.5	68.5	69.8	71.7
Accumulated Depreciation	500.0	566.7	632.9	698.9	764.9	831.1	897.5	964.4	1,031.9	1,100.4	1,170.2	1,241.8
Net Investment	1,000.0	993.8	990.4	989.8	991.9	996.6	1,003.2	1,013.0	1,027.0	1,047.0	1,074.9	1,105.4

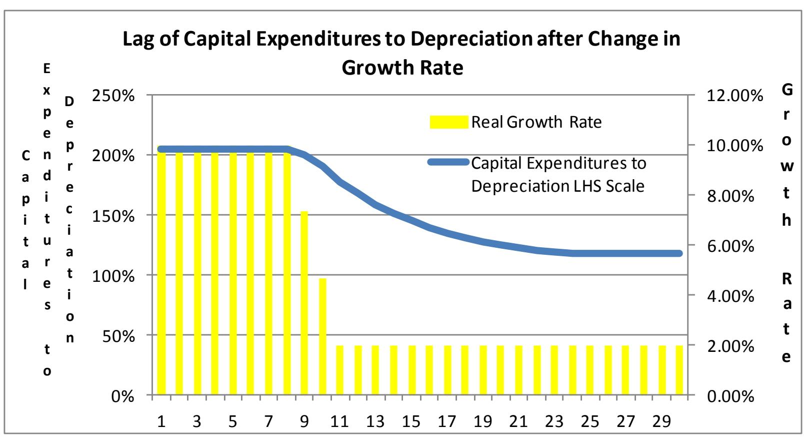
The stable ratio of capital expenditures to depreciation depends on the nominal growth rate in capital expenditures and the lifetime of the asset. With higher growth rates and the longer lived investments, the ratio of stable capital expenditures to depreciation is greater. The table below demonstrates how the ratio of capital expenditures to depreciation increases with both depreciation life and with the growth rate.

Ratio of Stable Capital Expenditures to Depreciation

Investment Life	Growth Rate 0%	1%	2%	3%	4%	5%	6%
3	100%	102%	104%	106%	108%	110%	112%
5	100%	103%	106%	109%	112%	115%	119%
10	100%	106%	111%	117%	123%	130%	136%
15	100%	108%	117%	126%	135%	145%	154%
20	100%	111%	122%	134%	147%	160%	174%
30	100%	116%	134%	153%	173%	195%	218%
50	100%	128%	159%	194%	233%	274%	317%

Changing Ratio of Depreciation to Capital Expenditures to Depreciation with Changes in Growth

The above discussion provides the ratio of capital expenditures to depreciation if everything is in equilibrium. However if growth rate changes, the depreciation rate from the growth rate during the first period continues to have an effect on the ratio of capital expenditures to depreciation until all of the assets that were put in service are retired. For example, if the assets previously grew at a rate of 30% implying a high ratio of capital expenditures to depreciation and then stop growing, the change in depreciation will lag the capital expenditure change until a full life cycle is worked through. The lag in capital expenditures to depreciation after growth rate changes is illustrated below where the ratio continues to decline for many years after the assumed change in growth. This means that one cannot simply insert the capital expenditures to depreciation into a DCF model as there will be a long-term transition period. The graph demonstrates that in the final year of growth in year eleven, the ratio of capital expenditures to depreciation has reached less than half of its progression moving from about 200% to about 100%. Similar phenomena occur for the ratio of depreciation to net plant.



In developing a comprehensive model of the EV/EBITDA the time lags until new stable ratios of capital expenditures to depreciation and stable ratios of depreciation to net plant. Method of working through issue one by one and using a comprehensive model that computes the EV/EBITDA short-term, transition and long-term periods. Describe how it is necessary to work through a life cycle – draw a diagram.

Need to first work through the asset and deferred tax balances to get capital expenditure to depreciation and see how there is a lag after the growth rate changes. Also get depreciation rate on net plant, change in deferred tax and deferred tax balance. Put in a graph of cycles.

Chapter 33: Moving from the Stable Ratio of Deferred Taxes to Capital Expenditures

Stable ratios for computing deferred taxes can be evaluated in a similar manner as the rate of capital expenditures to depreciation. Analysts tend to be a little intimidated by deferred taxes which sometimes results in large mechanical errors. With a bit of patience one can work through the deferred taxes and develop reasonable estimates for valuation. From an accounting standpoint, deferred tax represents a liability would be subtracted from enterprise value as the tax depreciation will be less than the book depreciation in the future. The accumulated deferred tax on the balance sheet contains the nominal value of the liability that would be repaid if there were no more capital expenditures or if the tax life equaled the book life. If the company keeps growing, the new capital expenditures will continue to generate new deferred taxes and a stable rate of new deferred taxes to can be computed in a similar manner as the ratio of capital expenditures to depreciation discussed above. As with book depreciation, an investment balance is set up for the deferred taxes instead of the book taxes. The difference between the tax deprecation and the book depreciation multiplied by the tax rate yields the change in deferred tax that should be added to free cash flow.

Ratio of Stable Deferred Tax to Capital Expenditures Assuming 40% Tax Rate and 20 Yr Life

		Growth Rate						
		0%	**1%**	**2%**	**3%**	**4%**	**5%**	**6%**
Tax Life	**1**	0.00%	3.51%	6.51%	9.08%	11.28%	13.17%	14.80%
	3	0.00%	3.12%	5.75%	7.96%	9.82%	11.39%	12.70%
	5	0.00%	2.74%	5.00%	6.88%	8.43%	9.71%	10.76%
	7	0.00%	2.36%	4.28%	5.85%	7.12%	8.14%	8.96%
	10	0.00%	1.79%	3.23%	4.37%	5.26%	5.96%	6.50%
	15	0.00%	0.88%	1.56%	2.08%	2.47%	2.75%	2.96%
	20	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

The table implies that accumulated deferred taxes should be ignored in the valuation except to establish the base of future tax depreciation. The only case in which the accumulated deferred tax measures value is under the extreme case where there are no capital expenditures and where the weighted average cost of capital is zero. If the discount rate is positive, then the accumulated deferred tax underestimates the value of the future tax deductions. If the capital expenditures are positive and growing, then deferred taxes on the future capital expenditures offsets the liability from existing deferred taxes. For the analysis to be accurate, and estimate should be made of the exiting tax depreciation should be made. This can be established from the exiting balance of deferred tax and is illustrated in the case exercise.

Chapter 28: Terminal Value in the Context of Philosophy Regarding the Ability to Earn Returns above the Cost of Capital in the Long-Run and the Problem of Assuming Companies will Stay in Business While Not Earning Any Economic Profit

Earning an economic profit is difficult and companies do not always earn economic profit. But if they do not earn economic profit they should force them to exit businesses.

Myth of Convergence of Return on Capital and Cost of Capital

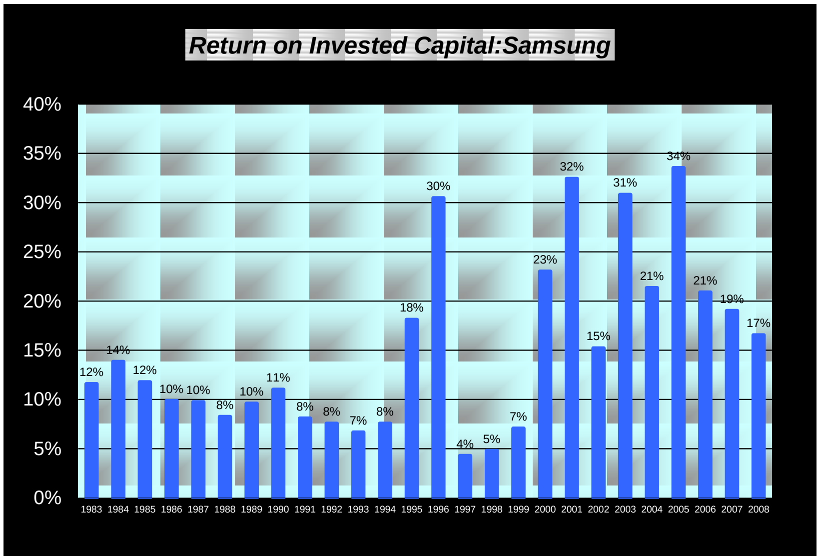
The discussion of growth made it seem as if a company can grow, then the value will increase. While the growth formula does apply two key factors that drive value – the growth rate and the cost of capital – it does not account for the third factor which is the rate of return on capital. The rate of return on capital

can change the way growth rate affects value. Using the growth rate formula makes it appear as if growth is always good for investors, which is not the case. If a company is earning below its cost of capital, or if it is just earning its cost of capital, then an increase in the growth rate does not increase value. Indeed, if a company is earning a return below its cost of capital it is better to have lower (or negative) growth. The implication that the growth rate only matters if the return is above the cost of capital means that the return relative to the cost of capital should explicitly or implicitly be a consideration in computing terminal value. To illustrate this idea, consider a very simple example where a company re-invests a portfolio of risk free treasury bills. The initial investment in a company is 100 and the return is 2% after the company wastes money on administrative costs. To finance the company, bank loans at a borrowing rate of 5% are made which is the same rate that investors could make if they invested in the treasury bills themselves. Thus, the return of 2% is below the cost of capital of 5%. If the company only lasts for two periods and if income is re-invested, then:

If the earned return is equal to the cost of capital, then the growth rate does not affect the value to investors as the company is doing nothing to either add or destroy value. This means that to resolve problems with wide variation in terminal value driven by growth rates, one can attempt to take the growth rate out of the process by assuming that the rate of return equals the cost of capital. If the return is equal to the cost of capital, then the value does not change whether the growth rate is 10% or -5%. All one has to do is to make a seemingly sensible assumption that over the long-run, competition will push returns down to the cost of capital as products become more commoditized. While one can make general arguments that the return driven by competitive advantage will converge to the cost of capital, the idea that rate of return will decline to the cost of capital is more difficult to accept than the idea that companies will stop growing. If a company cannot earn more than its cost of capital, it should not be in business and it should not make new investments. Recall the discussion in chapter 4 where it was demonstrated that the market to book ratio is equal to one when the return equals the cost of capital. The fact that the market to book ratio of companies is substantially above one is evidence that the companies do realize a rate of return above their cost of capital.

From an economic perspective, one can make the argument that competition will drive returns to the cost of capital in competitive and mature industries where there is little differentiation in products. However even in these circumstances it makes little sense to assume that company will make new investments without expecting some kind of economic profit. On the other hand, if a company is currently earning returns far above its cost of capital it is not reasonable to assume that such profit can last indefinitely. Companies can copy products, management techniques, marketing strategies and cost structures which temporarily allow some companies to realize extraordinary returns. As with the growth rate, some kind of explicit or implicit assumption must be made.

When inspecting mature companies, it is more difficult to find a consistent trend where the return on capital converges to the cost of capital than to find evidence of declining growth rates. (It is also tricky to compute the return on capital after the company experiences a large write-off for goodwill or asset impairment as the subsequent investment balance declines and the balance sheet no longer represents invested capital.) The example of Samsung Corporation shown below illustrates that return on invested capital has increased rather than declined, refuting the idea of cost of capital converging to return on capital. Many other mature large companies can be observed and it is quite rare to find companies that are just earning their cost of capital and have a return on capital similar to the cost of capital. Some argue that finding evidence of declining returns is again challenging because of survivorship bias in the statistical analysis, meaning that companies where returns fall go bankrupt and stop producing things and one cannot find long-term trends for these companies. Others argue that when companies become big, they are very careful to only make investments where the return is above the cost of capital. As with the survivor ship bias argument involving growth rates, this argument is impossible to ever resolve as, by definition, the data to prove the case does not exist. One is left with philosophy.



Despite difficulties in making the assumption that returns will suddenly converge to the cost of capital, a few points general points about the relationship between returns and the cost of capital can be considered:

1. When a company is earning a very high return on invested capital, it is reasonable to assume the return will begin converging to the cost of capital although it is not at all reasonable from a philosophical perspective that the return will completely converge to the cost of capital.
2. When constructing a financial model, one should be very suspicious of projected returns that are substantially above the historic returns. This implies that computing returns on equity and returns on invested capital after the financial statements are developed should be a standard part of the modeling process.
3. When evaluating returns it is often better to use the return on invested capital rather than the return on equity because the return on equity can be distorted by changes in historic or future capital structure.

Chapter 34: Four General Terminal Value Methods and Debates Involving Making Truly Independent Valuation versus Relative Valuations that Directly or Indirectly Depend on Valuations Made By Other People

The discounted cash flow model is the culmination of a series of finance theories including Modigliani and Miller, the Capital Asset Pricing Model and notions that companies eventually reach some kind of stable equilibrium. It is considered the central valuation approach by academics and, in its pure form the valuation approach is not dependent on the opinions of other analysts – which is sometimes called relative valuation -- as is the general case when multiples such as the P/E ratio and EV/EBITDA are used. The DCF analysis should derive value from reflecting the fundamental factors that drive the value including return on capital, cost of capital and growth rates. However, the discounted cash flow model, particularly using pure inputs (i.e. without using multiples), is fraught with both practical and theoretical difficulties. Problems in computing the cost of capital have already been discussed in chapter 4 relating to the accuracy of beta in measuring risk and difficulties in assessing the equity market risk premium. These cost of capital problems can translate into such wide ranges of valuation when applying the discounted cash flow model that the whole process can become all but useless in practical situations.

Further, difficulties in measuring the cost of capital are compounded by required assumptions to be consistent with respect to long-term stable growth rates in the calculation of terminal value. Applying growth rates in the terminal value formula without being very careful about adjustments to depreciation expense, working capital changes, capital expenditures and deferred tax can lead to biased valuations.

There is a high dependence in the discounted cash flow model on WACC to compute the present value of cash flows and the assumed growth rate in and/or the multiples applied to projected earnings. It is well known to practitioners that computing the discounted value of free cash flow is subject to a lot of bias and manipulation. All one has to do is ask somebody who has made a valuation analysis using the discounted cash flow technique to see how much the results can be fudged through tinkering a bit with the terminal growth, the discount rate or one of the assumptions. An illustration of the classic DCF problem is shown in extract below from a sell side stock analyst presentation. In the second table, the WACC only changes from 5.7% to 6.3% -- a very small variation given all of the problems and uncertainties associated with the capital asset pricing model. Further, the terminal growth rate varies between 2.5% and 3.1% which again is a very small variation considering all of the unknowns about the future state of the economy, future inflation and other company specific factors. Given this small variation in the cost of capital and the growth rates, the value of the stock varies from a low of 31.96 to a high of 65.43 or a range of more than 100%. This variation in valuation that results from small changes in variables – WACC and growth -- that are extremely difficult to assess renders the model useless even if the model faithfully applies all of the financial theories.

Valuation

We always find the greatest challenge with the ITC story coming from valuation, largely because there is no good comp group for the stock. Accordingly, we focus our efforts predominately on DCF valuation to take into account the large capital spending program over coming years and higher level of free cash generation at the end of the capital investment cycle. Exhibits 4 and 5 look at implied fair values for ITC under different discount rate and terminal value assumptions. Using the two methodologies (terminal multiple and perpetual growth), we are comfortable with a $46 fair value for the stock before taking into account the incremental value drivers identified in Exhibit 1.

Exhibit 4: DCF Valuation: Terminal Multiple

Terminal EBITDA Multiple	Discount Rate: 5.70%	5.80%	5.90%	6.00%	6.10%	6.20%	6.30%
9.25x	43.82	42.87	41.94	41.02	40.11	39.22	38.33
9.50x	45.64	44.67	43.72	42.78	41.85	40.93	40.03
9.75x	47.46	46.47	45.49	44.53	43.58	42.64	41.72
10.00x	49.28	48.27	47.27	46.28	45.31	44.35	43.41
10.25x	51.10	50.07	49.05	48.04	47.05	46.07	45.10
10.50x	52.92	51.86	50.82	49.79	48.78	47.78	46.79
10.75x	54.74	53.66	52.60	51.55	50.51	49.49	48.48

Source: Company data, Credit Suisse estimates

Exhibit 5: DCF Valuation: Perpetual Growth

Terminal Growth Rate	Discount Rate: 5.70%	5.80%	5.90%	6.00%	6.10%	6.20%	6.30%
2.50%	48.33	45.18	42.22	39.43	36.80	34.33	31.98
2.60%	50.72	47.40	44.28	41.36	38.60	36.01	33.56
2.70%	53.27	49.76	46.48	43.40	40.51	37.79	35.22
2.80%	55.99	52.28	48.81	45.57	42.53	39.67	36.98
2.90%	58.91	54.98	51.31	47.88	44.67	41.67	38.84
3.00%	62.05	57.86	53.97	50.35	46.96	43.79	40.82
3.10%	65.43	60.97	56.83	52.98	49.40	46.05	42.92

Source: Company data, Credit Suisse estimates

The reason for such wide differences in the above table is entirely due to the manner in which terminal value is computed using the formula:

$$\text{Terminal Value} = (\text{Last Period Cash Flow} \times (1+g)/(WACC-g))/(1+WACC)^{\text{number of periods}}$$

This formula uses WACC in two places, both in computing the terminal value in the last period in discounting the value to the present. To understand problems and alternatives when applying the DCF model, alternative approaches to the terminal value can be compared. To consider whether a reasonable practical alternative can be developed along with a method that yields numbers that can be applied, four different methods for computing the terminal value are discussed below:

Stable Growth Method

- Application of a stable growth formula above that uses the last or stable cash flow estimate along with a constant growth rate assuming the cash flow grows in perpetuity. Advantages of the

constant growth method are that it does not depend on the valuation made by others (i.e. it is not relative valuation) and it can be applied with a simple formula. Disadvantages are that it does not account for changes in cash flow that arise from changes in rate of return and that it results in a very wide range of results as illustrated above.

As already discussed, the standard terminal value formula in deriving the terminal value begins with the final year cash flow in an explicit period and applies the formula:

Terminal Value = Final Year Free Cash Flow x (1+stable growth)/(WACC-stable growth)

This formula is derived from the basic idea that a cash flow in perpetuity can be computed as:

Value = Cash $Flow_1$ / Cost of Capital

Since the growth rate applied to cash flow is the reverse of discounting and the cash flow in the next period is the current period multiplied by one plus the growth rate, the formula is the same as assuming the cash flow continually grows and the risk of the cash flow does not change. Because the WACC is in the denominator of the formula, the terminal value changes by a wide margin when the WACC varies. The formula is also very sensitive to the growth rate as a high growth rate can make the denominator very small and imply a high value. Finally, the growth formula can be easily be translated into the EV/EBITDA ratio as the terminal value is the enterprise value and the free cash flow is a function of the EBITDA.

TV = FCF/(WACC-g) = (EBITDA – Cap Expenditure – WC Change – Tax)/(WACC-g)

While questionable logic (such as assuming world economic growth will stop) and errors in the prediction of growth are pervasive in valuation, the errors in valuation analysis discussed here are not related to under-estimating or over-estimating growth. Precisely because the exercise of predicting growth is so difficult, it would be presumptuous to assert that valuation analyses were flawed when someone made an optimistic or pessimistic estimate. However, it is worthwhile to consider the relationship between growth and cost of capital. Growth rate uncertainty is a big part of the reason that cash flows themselves are uncertain and companies where valuations depend on high growth should have high cost of capital no matter what the CAPM suggests. Given the inherent uncertainty of guessing at what date growth rates will change, investments that do not depend on achieving high growth for a long time period should be valued more highly than investment strategies which cannot easily adjust to changes in growth.

Value Driver Method Including Return Relative to Cost of Capital

- Employment of a formula that considers both the growth rate and the prospective return that can be applied to income. This formula, labeled the value driver formula below and defined as (1-growth/return)/(cost of capital – growth), accounts for the possible convergence in returns to cost of capital over the long-term and is popular with some technicians. While the formula accounts for the drivers of value, one cannot make explicit assumptions about transition periods, changes in returns and movements in other factors. When explaining how valuation is derived, a disadvantage of this formula is that it is unclear what implicit assumptions are made with respect to transition periods from the current earnings to return on capital and cost of capital convergence.

Use of Multiples

Discuss analogy to financial crisis.

- Use of the EV/EBITDA or another multiple from relative valuation in deriving the terminal value. Advantages of this method are the range in values are less than the growth rate formula and that values are consistent with market estimates (in the above table taken from an actual

presentation, the range in growth value is between 54 and 38 rather than between 65 and 32). For companies that are already in a relatively stable phase with low growth and returns close to the cost of capital the method is logical. Disadvantages are that the EV/EBITDA multiples from comparative analysis are subject to manipulation of samples and that the EV/EBITDA multiples are not adjusted for differences in the company value as the growth rate of the company slows and as its return may converge to its cost of capital.

While use of a multiple seems to resolve the problem major problems that exist with the growth rate formula. Use of a multiple such as the EV/EBITDA ratio means that the valuation depends on the opinions of other people. To demonstrate the problem with applying multiples, recall the discussion of valuing homes before the financial crisis of 2008. Appraisers would play games with comparative samples where houses that sold for relatively low value would be excluded from the sample while homes with a high selling price – perhaps because of better features such as location – would be included. As the appraiser arrived at a higher value, the loan would be more and the selling price would be more. The higher selling price of the home in question would then be used in the next appraisal and a viscous circle would be created. To illustrate similar problems in making valuations using multiples, the excerpt below demonstrates how samples in deriving multiples can be very subjective and generally lack logic. The case involves a small freight airline company with a market capitalization of USD 175 million to that was compared with Federal Express with a market capitalization then of USD 5.971 billion.

Table 3
Valuation Table

Air Freight Company Comparables

Share prices as of close: 5/30/97

		52 week:			YTD		EPS			P/E			P/EBITDA			Ent.Value/EBITDA			P/E vs. SP500		
Ticker	Price	High	Low	Mkt. Cap.	Perf.	FY96A	FY97E	FY98E	P/B	FY96A	FY97E	FY98E	FY96A	FY97E	FY98E	FY96A	FY97E	FY98E	FY96A	FY97E	FY98E
ATLS	$ 28.75	$ 59.75	$ 19.88	$ 645.4	-39.8%	$ 1.88	$ 2.10	$ 2.50	3.0x	15.3x	13.7x	11.5x	1.5x	1.1x	0.9x	8.9x	6.4x	5.0x	0.74x	0.72x	0.64x
KTTY	16.75	17.25	8.00	175.1	67.5%	0.98	$ 1.15	$ 1.45	2.9x	17.1x	14.6x	11.5x	9.5x	5.2x	4.2x	10.3x	5.7x	4.6x	0.83x	0.76x	0.64x
FDX	52.38	57.88	36.25	5,970.8	17.7%	3.32	4.24	-	2.1x	15.8x	12.4x	NA	4.4x	4.0x	3.6x	5.5x	5.0x	4.4x	0.77x	0.65x	NA
ABF	36.25	38.38	19.50	803.3	63.6%	1.28	3.40	4.00	1.9x	29.9x	11.3x	9.5x	3.3x	2.6x	2.4x	4.8x	3.8x	3.5x	1.45x	0.59x	0.53x
								Mean	2.5x	19.5x	13.0x	10.9x	4.7x	3.2x	2.8x	7.4x	5.2x	4.4x	0.9x	0.7x	0.6x
								Adj. Mean	1.3x	16.4x	13.0x	5.3x	3.9x	3.3x	3.0x	7.2x	5.3x	4.5x	0.8x	0.7x	0.3x
								High	3.0x	29.9x	14.6x	11.5x	9.5x	5.2x	4.2x	10.3x	6.4x	5.0x	1.5x	0.8x	0.6x
								Low	1.9x	15.3x	11.3x	9.3x	1.5x	1.1x	0.9x	4.8x	3.8x	3.5x	0.7x	0.6x	0.5x

Note:
Enterprise Value = Market Value + LT Debt - Cash and Equivalents
ATLS = Atlas Air
KTTY = Kitty Hawk
FDX = Federal Express
ABF = Airborne Freight

Source: Company reports and Scott & Stringfellow estimates

Derived Multiple Formula

- Development of a formula for the EV/EBITDA ratio that can be applied in the terminal value calculation that explicitly accounts for varying transition growth and return periods, stable ratios of capital expenditures to capital expenditures, stable depreciation rates and stable levels of deferred taxes relative to net plant. This approach which was illustrated in the introduction forces one to directly consider a host of variables that drive the long-term value including different rates of convergence between return and cost of capital, declines in cost of capital during stable growth periods, as well as changing growth rates and asset replacement. Advantages of this approach are that it is flexible and it reduces large variation in valuations. Disadvantages of the method are

that it requires a number of somewhat complicated calculations and it is not commonly used in valuation.

The remainder of this section considers theoretical issues associated with measuring stable growth rates and resolving DCF problems using the four alternative approaches summarized above. The first part discusses theoretical and practical issues associated in applying the stable growth rate formula. The second section turns to the value driver formula and describes general issues related to the convergence of cost of capital and return on capital. This section covers how growth and cost of capital can be translated into a P/E ratio and how the derived P/E ratio can consider changes in real growth, movements in rates of return and variation in the cost of capital. The final section works through calculation of the EV/EBITDA ratio that was illustrated in the table at the beginning of the chapter. This analysis requires development of stable ratios for stable depreciation rates on net plant, stable ratios of capital expenditures to net plant and stable ratios of deferred tax to net plant which depend on the lifetime of plant and the future growth rate.

One can account for both growth and return on capital relative to cost of capital through applying a formula to the NOPLAT as shown below (recall that NOPLAT is EBIT x (1-t)):

Enterprise Value = NOPLAT x (1 – asset growth/ROIC)/(WACC – asset growth)

This formula, which is derived below, implies that the value of a company can be computed from the growth rate, cost of capital and return parameters along with the current level of income. It seems to be a magic result and in some sense it is. Note that the formula is somewhat confusing in that it will produce a different result if the level of income is different. This means that the value depends on both the current level of return as well as the stable return. For example, if two companies have the same level of investment, the same cost of capital, and the same future return and growth but different levels of NOPLAT, then they are currently earning different rates of return. As the level of NOPLAT is different for the two companies, the enterprise value is different demonstrating that the formula is affected by both the current return and the prospective return. If the cost of capital is currently below the return on capital and the return on capital is the incremental cost of capital, then some argue that the formula results in assuming that the existing assets earn the current return while new investments earn an incremental return. Further, as demonstrated below, if the return on new investments is assumed to be the same as the cost of capital, then the formula implicitly removes the effect of growth from the terminal value and the value of the company is more dependent on the ability of exiting assets to earn an economic profit.

Chapter 35: Is the Value Driver Formula a Solution to All of these Problems or is it a Black Box Containing Many Implicit Assumptions that Are Almost Impossible to Dissect

The value driver formula that accounts for returns, risks and growth seems to solve problems inherent with both the growth rate method and the method that uses valuation multiples. Some assert that this method is superior to the other approaches both from a practical and a theoretical perspective. This chapter presents a critical analysis of the value driver formula and concludes that the formula is not the nirvana that can solve all sorts of problems. Instead, the formula contains biases and implicit assumptions that render it problematic in real word applications.

Deriving the Value Driver Formula in the Case of the P/E Ratio and Equity Earnings

To assess the usefulness of the value driver formula it is useful to work through the mechanics of how the value driver formula is derived. In explaining how the value driver formula works, one can begin with establishing the formula for the P/E ratio using ROE, cost of equity, growth in earnings and the level of earnings. Once the formula for the P/E is established, an analogous formula can be developed for the EV/EBITDA multiple using the ROIC and the WACC. While the formula for enterprise value is more

useful in computing terminal value, the formula for equity value with ROE, growth and cost of equity is more convenient in deriving the equation.

To understand the value driver formula where value is driven by rate of return, growth and cost of capital, begin with the dividend discount model where the price of a stock price is determined by the cost of capital along with an estimate of the growth rate in dividends. By assuming that marginal investors believe the growth rate in dividends is constant forever, one can establish the well-known dividend discount equation for computing the value of a share that was discussed in earlier chapters. The value of a share is the next anticipated dividend divided by the difference in the cost of equity and the growth rate in dividends (the mathematics of the formula requires using the next year cash flow rather than the current period dividend):

$$P_0 = D_1/(k\text{-}g)$$

When combining this formula with the sustainable growth rate formula, the value driver formula can be computed. The sustainable growth formula for dividends is dependent on the rate of return and the dividend payout ratio. If all earnings are re-invested implying a zero dividend payout ratio, then the equity balance grows by the return on equity which means that dividends also grow by the return on equity. On the other hand, when the dividend payout ratio is 100%, none of the income is re-invested and the growth rate is zero. The growth rate is a function of the return on equity and the payout ratio as reflected in the sustainable growth rate formula:

Sustainable growth = ROE x (1-dividend payout)

This formula can be re-arranged (and is much more useful) when the dividend payout ratio is computed as a function of growth. In real companies it is the growth rate opportunities or lack thereof that drives dividends and not the other way around. The formula for the dividend payout ratio becomes:

Dividend Payout = 1 - Sustainable growth/ROE

Since dividends equal the dividend payout ratio multiplied by the dividend per share, the dividends can be expressed as:

$$D_1 = (1\text{-}g/ROE) \times EPS_1$$

Using this formula for dividends, the value and the P/E ratio can be expressed in terms key value drivers – the ability to earn more than the cost of capital and the ability to grow that difference. By substituting the formula for D_1 into the formula for the current price, the price of the share becomes:

$$P_0 = [1\text{-}g/ROE] \times EPS_1/[k\text{-}g]$$

If the earnings are divided by the price of the share, then the forward P/E ratio can also be defined through simply dividing the price by the earnings in the above equation:

$$P_0/EPS_1 = [1\text{-}g/ROE]/[k\text{-}g]$$

Deriving Implicit Assumptions about the Progression of ROE in the Value Driver Formula using the Equity Perspective

To understand implications of the value deriver formula it is useful compute the weighted average return on equity over time implied by the value formula. One can first compute the value of a company from the formula using a long-term analysis as introduced above: In this formula, the initial book value and the ROE_1 establish the first year income. The overall ROE is a weighted average between the first ROE applied to the initial investment and the remainder.

The confusion around the value driver formula comes about because the return on equity inherent in the EPS_1 is not necessarily the same as the ROE in the right hand side of the equation. The 1-g/ROE term drives future dividend growth where the ROE is the return on new investments, but this is not the same as the ROE inherent in the EPS_1 value. To see this more clearly, EPS_1 can be defined as Existing ROE multiplied by existing investment and the ROE in the formulas above can be defined as the incremental ROE. The equation for the value of equity becomes:

$$\text{Equity Value} = ROE_1 \times \text{Current Equity} \times (1\text{-}g/\text{Incremental ROE})/(k\text{-}g)$$

In future years, it is possible to compute a weighted average return on equity that is derived from the current book value of equity and the incremental equity that is generated from growth or form not paying out the current earnings as dividends:

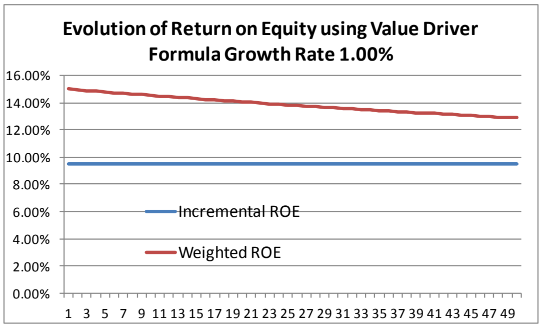
$$\text{Weighted ROE} = ROE_1 \times \text{Current Equity} \times \ \text{Incremental ROE} \times \text{New Equity}$$

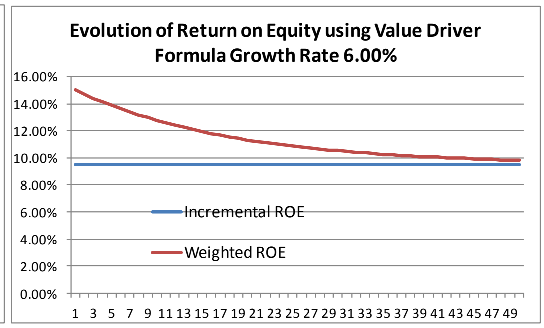
Once the weighted ROE is derived, the implied dividend payout can be computed using the sustainable growth rate formula discussed above using the formula 1-g/ROE. With the dividend payout ratio and the progression of the weighted average ROE, the earnings and the dividends can be established. As the equity capital grows, the proportion of ROE that comes from the initial ROE declines and the proportion that comes from the return on new investment increases. The higher the growth rate, the faster more the weighting is skewed to the incremental ROE and the less to the original ROE.

Value Driver Formula Analysis

Beginning Book Value	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Initial ROE	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Initial Earnings	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Incremental Opening Balance of Book Value		-	0.30	0.61	0.93	1.26	1.59	1.94	2.30	2.67	3.05
Weight of Book Value for Initial ROE		100%	97%	94%	92%	89%	86%	84%	81%	79%	77%
Weight of Book Value for Incremental ROE		0%	3%	6%	8%	11%	14%	16%	19%	21%	23%
Incremental ROE		14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%	14.00%
Weighted ROE		25.00%	24.68%	24.37%	24.07%	23.77%	23.49%	23.21%	22.94%	22.68%	22.43%
Dividend Payout		88.00%	87.84%	87.69%	87.53%	87.38%	87.23%	87.08%	86.92%	86.77%	86.63%
Growth Rate		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Incremental Equity											
Opening Balance		10.00	10.30	10.61	10.93	11.26	11.59	11.94	12.30	12.67	13.05
Add: New Earnings		2.50	2.54	2.59	2.63	2.68	2.72	2.77	2.82	2.87	2.93
Less: Dividends		2.20	2.23	2.27	2.30	2.34	2.38	2.41	2.45	2.49	2.54
Closing Balance	10.00	10.30	10.61	10.93	11.26	11.59	11.94	12.30	12.67	13.05	13.44
Incremental COE		12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%
PV of Dividends	21.39		Formula: P/E = (1-g/ROE)/(k-g)			8.73					
			Formula: P = E * (1-g/ROE)/(k-g)			21.83					

The manner in which the ROE gradually converges to the incremental ROE with different growth rates is illustrated in the two graphs below. In the first case with 1% growth, the ROE remains more than 200 basis points above the incremental ROE after 50 years. With 6% growth, the weighted return converges much faster as more of the equity consists of the new equity. In year 15, the difference in ROE is more than four percent if the growth is 1% while the difference is about 2% with the 6% growth rate.





Some people would be quite satisfied with these graphs and explain how the marginal rate of return on investments should drive value. Further, as the incremental return does not suddenly decline to the incremental return, the formula has a reasonable transition period. Supporters of the formula Insist that you just have to understand that difference between the marginal return and the existing return.

In practice, more people would care about the weighted average ROE than the incremental ROE. If you owned a factory that makes portable telephones and your telephones fell out of favour, you would not care about some kind on incremental ROE on hypothetical new investments in new factories that you have not built yet. You would care about your existing investment. Similarly, if you owned a food business and the margins a squeezed by increasing costs of inputs, it is dnot the marginal return on new investments that is causing the problem. Instead, you are interested in the progression of the overall return on your equity investment.

In addition to the conceptual problems with the value driver whereby one does not really know what is happening to the weighted average return on equity, the graphs above demonstrate a more basic problem with method. This problem is that the return on initial investment never goes away. ever lose the First ROE even though investments fully depreciated
Weighted average ROE and transition from initial ROE to incremental ROE strongly affected by growth. With zero growth, there is no effect of incremental ROE

Factory example. Invest and then goes out of favour. Do not keep return on initial factory.

The ROE actually earned is the weighted average of the current ROE or the ROE in the terminal period and the ROE on new investments.

- After assets depreciated, the ROE should only be on the new investments
- One can compute the weighted average ROE by creating a simple model.

Show the calculation of incremental ROE from weighted average ROE

Separate earnings from new investments and from existing investments
Compute the ROE on new investments from the incremental ROE
Determine the weighted average ROE
Compute the dividend payout ratio from the weighted average ROE

Is there any reason that the convergence should be difference

Shows that after life cycle of investment still have the effects of the first investment.

The graphs above demonstrate some of the problems in applying the value driver formula. If the growth rate is lower, the competitive advantage may be disappearing faster and perhaps the convergence should be faster instead of slower. In either case, the time it takes to converge is relatively long and there is no flexibility to adjust the time frame for moving the convergence of the rate of return. There is no economic theory that suggests returns on existing investments can be maintained (without some kind of contract) and there is no economic theory that implies that low growth companies can maintain returns for longer periods of time. The graphs demonstrate that the reason for lower variability in returns is Finally, the length of time for the returns to converge do not account for depreciation and aging of existing assets.

Deriving the Value Driver Formula in the Case of the EV/EBITDA Ratio and Return on Invested Capital

The value driver formula applied in developing free cash flow is similar to the one derived above using equity returns and growth in income except that NOPLAT replaces EPS, WACC replaces the cost of capital and the growth in invested capital replaces the growth in equity capital. When applying this formula, the current level of return implied in the existing NOPLAT generally has a different value than the incremental ROIC in the formula. To understand development of the formula, begin with the formula for free cash flow derived from NOPLAT as follows:

Free Cash Flow = NOPLAT + Depreciation – Capital Expenditures – WC Changes + Deferred Tax

As invested capital grows by capital expenditures and working capital changes and declines by deferred tax changes and depreciation, the above formula for free cash flow can be re-written as:

Free Cash Flow = NOPLAT - Growth in Invested Capital

Since the NOPLAT can be expressed as the current return multiplied by the invested capital, the free cash formula can be further re-stated as:

Free Cash Flow = ROIC x Invested Capital + g x Invested Capital, or

Free Cash Flow = NOPLAT + g x NOPLAT/ROIC, or

Free Cash Flow = NOPLAT x (1 + g/ROIC)

Given that NOPLAT grows by the growth rate in invested capital if the ROIC remains constant, if the growth rate does not change, the enterprise value is the FCF/(WACC-g) or:

Enterprise Value = NOPLAT x (1-g/ROIC)/(WACC-g)

Derivation of the formula does demonstrate that the growth rate applied in the formula is the growth rate in invested capital which is not necessarily the same as the growth rate in EBITDA or sales as explained below. As with the equity based formula, the formula for enterprise value can be expressed in terms of the current return implied in the NOPLAT and the return that is implied in future growth as shown below.

Enterprise Value = Invested Capital x $ROIC_1$ x (1 – asset growth/$ROIC_2$)/(WACC – asset growth)

The formula can be used to demonstrate that when the incremental future return equals the cost of capital, the growth rate does not matter in establishing the enterprise value. Here, the formula boils down to the simple perpetuity formula and the value of the company is simply the current level of invested capital multiplied by the ROIC divided by the cost of capital. To work though this formula, assume that ROIC = WACC, then:

Enterprise Value = Invested Capital x $ROIC_1$ x (1 – g/WACC)/(WACC – g)

$$\text{Enterprise Value} = \text{Invested Capital} \times \text{ROIC}_1 \times ((\text{WACC} - g)/\text{WACC})/(\text{WACC} - g)$$

The term WACC-g falls out of the equation and enterprise value becomes:

$$\text{Enterprise Value} = \text{Invested Capital} \times \text{ROIC}_1/\text{WACC}$$

Where the return on capital equals the invested capital on future assets, the value of a company all comes from the existing assets and the return on those assets relative to the cost of capital. Here, it is not necessary to worry about future growth and the long-term prospects for the company. The value of the company is more analogous to project finance investments and the fact that a corporation is supposed to last indefinitely does not matter.

Example of Working Capital shows that the Value Driver Formula is not only a Black Box but it is Just Plain Wrong in Deriving the EV/EBITDA Ratio

As with the formula for equity returns, a big problem with the value driver formula is that it is difficult and unintuitive with respect to the definition and interpretation of returns. This is a big enough problem that many would argue renders the formula useless. But difficulties with the formula are even worse when one delves into the formula in more detail. By working through the details of the value driver formula when growth rates or returns change, it becomes clear that not only is the formula almost impossible to interpret, it does not produce a correct valuation. As in other cases in this part of the book, to demonstrate issues working capital is the starting point. One would think that a hypothetical case with no taxes, no capital expenditures, no depreciation and no deferred taxes would not have any biases in valuation. However when working through a simple case where a company has nothing other than working capital, you are forced to understand items that cause biases in the formula.

In a simple case with no taxes and no capital expenditures, and only accounts receivable, the formulas that can be used to define enterprise value include: EV = (EBITDA-WC Increase)/(WACC-g); EV = (EBITDA – WC Increase)/(WACC-g); or,

$$\text{EV} = \text{Working Capital} \times (\text{ROIC}-g)/(\text{WACC} - g)$$

As invested capital equals working capital and Invested Capital = NOPLAT/ROIC, if a company has nothing other than working capital, then the working capital formula is:

$$\text{Working Capital} = \text{NOPLAT}/\text{ROIC} \text{ or } \text{ROIC} = \text{EBITDA}/\text{Working Capital}$$

If a company only has accounts receivables in working capital and no operating expenses, then the return on investment formula simplifies to:

$$\text{ROIC} = \text{Sales}/\text{Accounts Receivable} \text{ or } \text{Accounts Receivable}/\text{Sales} = 1/\text{ROIC}$$

The formula demonstrates that when the ROIC is changed, the ratio of income to working capital must also change and one cannot hold ratios of days sales outstanding constant and also change the return on investment assumption.

Valuation errors from applying the value driver formula come about because the growth rate is sales cannot be equal to the growth rate in investment when assumptions are made about changing return on investment. If the sales growth rate changes, the rate or investment growth will differ from the rate in sales growth. Further, if the incremental ROIC change from the existing ROIC and the rate of sales does not change, the rate of change in the cash flow will not equal the rate of change in the sales. This means that if you input the sales growth rate and the current ROIC and the incremental ROIC in the formula, the value is not consistent with these parameters. To see how this works, consider a case where the growth rate in sales changes from 50% to 10%.

Sales	100	110	142
A/R to Sales	8%	8%	16%
A/R Level	8	24	

prosepective Say you want to change the In The value driver formula applied in developing free cash flow is similar to the one derived above except that NOPLAT replaces EPS, WACC replaces the cost of capital and the growth in invested capital

While the value driver formula seems very sophisticated and useful for resolving problems with terminal movement in the return on invested capital over time. The manner in which the return is assumed to implicitly converge to the future return is described below in working through the mechanics of the formula. Other difficulties with the formula value driver formula in computing value involve:

- Implicit and difficult assumptions with respect to the level of capital expenditures included in the current level of NOPLAT which may not be consistent with future growth rates. For example, if the company experienced fast growth rates in the past, it may have a high depreciation charge in the current level of NOPLAT. As the company growth slows, the relative level of depreciation to EBITDA in NOPLAT changes.

- Tricky assumptions with respect to working capital and deferred tax investment that is included in the current level of ROIC (which divides EBIT x (1-t) by invested capital that includes working capital and deducts deferred tax) relative to the future level of ROIC.

- Alternative cost of capital that could be applied to the current investment relative to the incremental level of investment, particularly if the current level of investment was made in a risky period of growth.

- The current level of investment is assumed to occur indefinitely without declining, and assets are assumed to remain in place without requiring re-investment. If an industry is becoming more competitive with increased competition from around the world, there is no particular reason to assume that a very high return on existing assets can be maintained.

- If the return on assets in an industry is declining, it is logical that the return on the re-investment required for the existing assets should also fall implying that the existing asset base should not have a constant ROIC.

- If the assumption of a return equal to cost of capital is used, then the return on new assets is assumed to immediately fall to the cost of capital without any transition period.

- Using an assumption that companies do not generate returns above the cost of capital produces multiples that are not consistent with observed multiples over the long-run. If the equity risk premium is 5% and the risk free rate is 5% implying a cost of capital of 10%, the P/E ratio should be 10 (1/10%). The long-run P/E ratio of 15 times for the overall market is above this level and there is little evidence that P/E ratios decline as companies become more mature.

Problem Number One: The Value Driver Formula Does not Work Even When Invested Capital is Only Working Capital

Begin as usual with working capital. If there is only working capital, the ROIC depends on the management of working capital. If you are going to increase the return on invested capital, then you must manage working capital more efficiently. On the other hand if the ROIC declines, then the management has become worse. Nothing else effects ROIC. If the growth rate in working capital remains constant,

but the incremental ROIC declines from the current ROIC, then the EBITDA growth must decline. There is nothing else that can happen. There is nowhere else to go. Then the EBITDA will have a different growth rate from the growth in invested capital. But the growth in EBITDA does not equal the growth in invested capital. The growth rate in EBITDA inflow is lower than the growth rate in working capital outflow and the basic formula does not work.

Demonstrate how this works with the formula for EBITDA

Chapter 36: Computing an Implied P/E Ratio in Terminal Value Calculations with Explicit Assumptions with Respect to Returns, Growth and the Cost of Capital

If you spend time watching financial analysts on television sounding highly intelligent in their opinions about the value of a stock, they generally pontificate about both the projected earnings and the valuation. The analysts generally make some kind of earnings projection (that is often optimistic) and then apply a future P/E ratio to the projected earnings to arrive at what they think the future price will be. What they have done is compute equity cash flow rather than free cash flow where the future earnings multiplied by the P/E is the terminal value and the dividends received during the intermediate period are like the explicit free cash flow. These valuations are analogous to the DCF being discussed except the valuation is made with equity cash flow rather than free cash flow. When computing the future price using a future P/E ratio, the financial analysts often seem to have some kind of magic way to project the future P/E ratio that drives the valuation. This section addresses techniques to evaluate the P/E ratio for purposes of computing terminal value (and take the magic out of process). Evaluating the P/E ratio is a precursor to evaluating the EV/EBITDA ratio for use in the DCF that is driven operating characteristics.

The close relationship between the P/E ratio and the EV/EBITDA ratio can be illustrated considering an extreme case for a company with no taxes, no debt and no depreciation. In this case the equity value is the same as the enterprise value and the EBITDA is the same as the net income (EBITDA minus depreciation minus interest minus taxes equals net income). Since the net income equals EBITDA and enterprise value equals the equity value in this very special case, the P/E ratio equals the EV/EBITDA ratio. This means that when factors such as growth, return and cost of capital influence the P/E ratio, these same ideas will affect the EV/EBITDA ratio that is applied in the DCF model. When using a multiple for computing the terminal value, the range in valuations declines dramatically as illustrated in the two tables below. The first table (using the DATA TABLE function in excel) illustrates the wide range in value that arises from variation in the WACC and terminal growth rates. The second table demonstrates the much smaller valuation that occurs when the EV/EBITDA ratio is used instead of the growth rate.

Problems with use of multiples such as the EV/EBITDA ratio do not arise only because of the relative valuation problem. Another issue involves the fact that multiples such as EV/EBITDA and P/E ratio should change over time as a company matures and grows more slowly and as its return converges to the cost of capital. As demonstrated above, when the return on investment equals the cost of capital, the multiple is simply one divided by the cost of capital, no matter what is the growth rate. However when the return is above the cost of capital and the company is growing quickly, the multiple can be very high. Academics who complain about using multiples in the DCF model insist that that the multiple that currently exists when making comparisons of current companies cannot be used in terminal value calculations. To address problems with relative valuation in assessing multiples, the P/E ratio is with different long-term and short-term growth rates; different short-term and long term returns and changing cost of capital. Through explicitly considering the these factors along with transition periods, the multiples can be derived without resorting to relative valuations and without distorting the valuations for changing growth rates, returns and costs of capital. Through using the implied multiples in the terminal value calculation and computing those multiples value drivers and transition factors, one can enter things like

the long-term real growth, the difference between the ROIC and the WACC and the risk premium on the WACC in the DCF analysis.

In modeling the implied P/E ratio from value drivers, a couple of formulas and concepts can make the process much easier. The first idea is to compute transition factors for each variable that can be different in the long-term versus the short-term. If variables have time differentiation (i.e. short-term and long-term values), it is generally not reasonable to assume that the change in the variable suddenly changes in one year. Instead, the variable should gradually change from the short-term rate to the long-term rate. The period over which the variables gradually change is called the transition period. This means the transition period as well as the short-term period should be defined (the long term period is not necessary because it is the sum of the short-term period and the transition period.) In computing values over the transition period, the following two formulas can be used to interpolate assuming a long-term and short-term ROE:

$$ROE_t = (1 + g) \times ROE_{t-1}$$

where,

$$g = (ROE_{long\ term}/ROE_{short\text{-}term})^{(1/(1+transition\ period))}$$

or,

$$ROE_t = ROE_{t-1} + \text{Linear Factor}$$

where,

$$\text{Linear Factor} = (ROE_{long\text{-}term} - ROE_{short\text{-}term})/(1+\text{transition period})$$

To see why the term (1+transiton period) should be used rather than the transition period, consider the case of an immediate transition without a transition period. In this situation, the transition period is zero and the growth rate is $ROE_{long\ term}/ROE_{short\text{-}term}$ while the linear factor is zero. If one was not added to the transition period as in the above the calculations would not be possible in the case of an immediate transition. Considerations about whether to use the growth rate formula or the linear formula depend on whether it is possible to have a negative ROE (or other factor that will be subject to transition and interpolation). If there is a negative number, the more elegant growth rate formula does not work while the less fancy linear factor still applies.

Discounting cash flow can also be used to understand the theoretical drivers of the P/E ratio and the EV/EBITDA ratio. These ratios can be computed by the fundamental drivers of value discussed at the beginning of the book; namely earning a return above the cost of capital and growing the firm. Deriving the P/E ratio and the EV/EBITDA ratio may not be of much value in everyday valuations. However understanding what really drives the ratios can be instructive in thinking about valuations. To understand the drivers of value and the level of the two ratios, the growth rates can be separated into short-term and long-term growth rates. Further, the cost of capital can be broken down to building blocks – the real rate of interest, the inflation rate and the risk premium. Each of these factors can be differentiated by time period as with the growth rate. The rate of return earned on investment can be expressed as the cost of capital plus a premium and this return is multiplied by the rate of investment to establish income. For computing the EV/EBITDA ratio, factors for tax rates, depreciation rates, working capital and deferred taxes should be added. To demonstrate the process the P/E ratio is discussed first and the EV/EBITDA is subsequently addressed.

In modeling the P/E ratio, the drivers include:

- The growth rate in earnings in the short-run and the long-run
- The rate of return earned above the cost of capital in the short-run and the long-run
- The rate of inflation in the short-run and the long-run
- The real rate of interest

- The risk premium above the nominal interest rate in the short-run and the long-run

When deriving inputs for these value drivers, considerations include:
- The real growth rate in the long-run should not be more than the expected nominal growth rate in the economy (which some would say is the same as the real rate of interest)
- The spread between the return on equity and the cost of capital in the long-run should decline with increased competition and other factors; but it should not be zero. Without earning a return above the cost of capital, the company has no reason to be in business.
- Despite elegant theory on estimating the risk premium, a simple idea should drive the risk premium; when growth rates are lower and returns are lower, the risk is also lower. With stable growth and low earnings, the risk premium should not be much higher than credit spreads.

When applying the dividend discount model or the P/E equation, it is simple to assume that cash flow accruing to shareholders as dividends grow at different rates at different points in time. This idea of applying two or more growth rates in a DCF analysis is not new.

After the implied dividend payout ratio is computed using the formula 1-g/ROE, the net income per share, the book value per share and the dividends per share can be calculated through creating a table of the progression in the balance of equity invested capital. The closing balance of the equity investment is the opening balance plus the income less the dividends. The income and dividends are computed from the following formulas:

- Net Income = Return on Equity (short-term, long-term or transition) x Opening Balance
- Dividends = Dividend Payout (short-term, long-term or transition) x Net Income
- Value of Equity = PV(at cost of cost of equity, of dividends)
- P/E Ratio = First Year Net Income/Value of Equity

The process of computing the P/E ratio using a build-up of the equity balance is illustrated below.

	P/E Ratio		19.90										
Summary	Equity Value		25.37										
	Market to Book		1.69										
Growth Rates													
Real Growth Rate		3.00%	3.00%	3.00%	3.00%	3.00%	2.77%	2.55%	2.35%	2.17%	2.00%	2.00%	2.00%
Nominal Growth Rate		4.03%	4.03%	4.03%	4.03%	4.03%	4.00%	4.03%	4.13%	4.30%	4.55%	4.55%	4.55%
Dividend Payout Ratio		52.59%	52.59%	52.59%	52.59%	52.59%	49.51%	46.19%	42.63%	38.88%	35.00%	35.00%	35.00%
Book Value per Share Balance													
Opeining Book Value Per Share		15.00	15.60	16.23	16.89	17.57	18.28	19.01	19.77	20.59	21.47	22.45	23.47
Add: Earnings		1.28	1.33	1.38	1.44	1.49	1.45	1.42	1.42	1.45	1.50	1.57	1.64
Less: Dividends		0.67	0.70	0.73	0.75	0.79	0.72	0.66	0.61	0.56	0.53	0.55	0.58
Closing Balance	15.0	15.60	16.23	16.89	17.57	18.28	19.01	19.77	20.59	21.47	22.45	23.47	24.54
Valuation													
Discount Rate		6.50%	6.50%	6.50%	6.50%	6.50%	6.18%	5.97%	5.87%	5.88%	6.00%	6.00%	6.00%
PV Factor		0.94	0.88	0.83	0.78	0.73	0.70	0.67	0.63	0.60	0.56	0.53	0.50
Equity Value per Share	25.37												
P/E Ratio	19.90												

Chapter 37: Computing an Implied EV/EBITDA Ratio in Terminal Value Calculations with Explicit Assumptions with Respect to ROIC, Alternative Growth in Capital Expenditures or Revenues, Plant Lives, Tax Rates, Working Capital and Tax Depreciation

An alternative way to compute terminal value using in the DCF model is to apply a multiple to the terminal EBITDA rather than to use the standard terminal growth rate formula known as Gordon's model. This involves multiplying the EBITDA in the terminal year by an EV/EBITDA multiple. If this approach is applied, the terminal value is no longer directly sensitive to the discount rate and the growth rate as illustrated by the simplicity of the formula for terminal value:

$$\text{Terminal Value}_t = \text{EV/EBITDA} \times \text{EBITDA}_t$$

The problem with applying the EV/EBITDA ratio in terminal value calculations is determining what multiple to use. If multiples are used from comparison of other companies – i.e. from relative valuation – a legitimate criticism is that multiples in the current market place are driven by short-term factors while the long-run multiples appropriate for use in DCF analysis are a function of stable growth rates and stable returns. Instead, the EV/EBITDA ratio can account for the return on investment, the cost of capital and the growth rate. This can be accomplished through simulating the theoretical multiple from assumptions with respect to cost of capital, rate of return, capital expenditure to depreciation relationships and the tax rate. The table and the chart below contain inputs used to compute the EV/EBITDA on an independent basis. The title of the chart shows that the terminal EV/EBITDA is 6.86 while the entry EV/EBITDA is 7.84. Different assumptions with respect to growth rates, returns, risks and transition factors yield different assumptions with respect to the terminal EV/EBITDA. Further, the assumptions for the risk premium – the most difficult assumption -- can be adjusted to make the current EV/EBITDA consistent with the ratio observed in the market.

Many of the complexities in computing terminal value and deriving multiples are illustrated on the graph and table below which demonstrates theoretical drivers of the EV/EBITDA ratio. In this figure, the EV/EBITDA ratio is computed from simulation of free cash flow, use of the growth rate formula and a formula that uses the return, the growth rate and the cost of capital. All of the factors that drive the EV/EBITDA ratio are included in the figure including the life of the assets, tax rates, transition factors, rates of return, costs of capital and growth rates. The graph and table demonstrates that when traditional multipliers using a constant growth model or a simple value driver formula from return on invested capital and growth are applied, the valuation produces mechanical errors.

Book Life (Asset Replacement)	30
Tax Life	10
Tax Rate	30.00%
Working Capital to Plant	13.00%
Transition Years - Growth	6
Transition Years - ROIC	30
Transition Years - WACC	30
Short Term Period	7

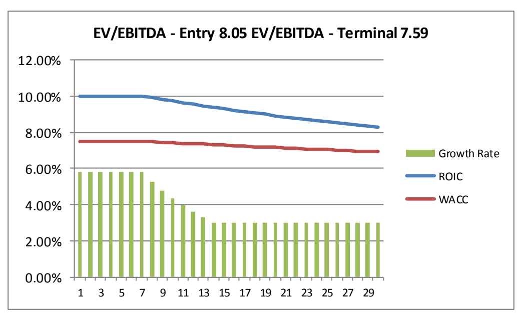
Sensitivity

	Current	Long-term
ROIC	10.00%	7.80%
WACC	7.50%	6.72%
Growth	5.80%	3.00%

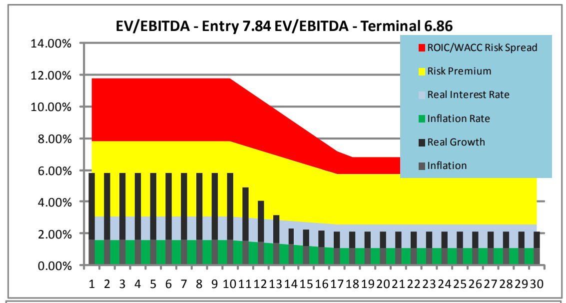
LT = ST

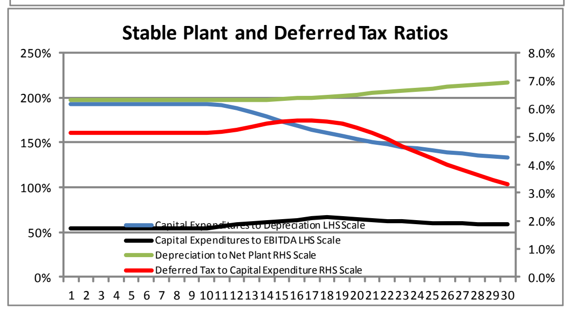
Reset

Year of Valuation	1	7
EV/EBITDA - Theoretical	**8.05**	**7.59**
EV/EBITDA - Value Driver	12.63	8.45
EV/EBITDA - Growth Rate	12.63	5.75



Book Life (Asset Replacement)	25	
Tax Life	10	
Tax Rate	23.00%	
Working Capital to Plant	11.00%	
Transition Years - Growth	3	
Transition Years - ROIC	7	
Transition Years - WACC	6	
Short Term Period	10	
	Current	**Long-term**
Inflation Rate	1.60%	1.10%
Real Interest Rate	1.50%	1.50%
Risk Premium	4.70%	3.14%
Total WACC	7.97%	5.84%
ROIC/WACC Spread	3.94%	1.06%
Total ROIC	12.22%	6.96%
Real Growth Rate	4.20%	1.00%
Inflation Rate	1.60%	1.10%
Nominal Growth Rate	5.87%	2.11%
Stable Cap Exp/Depreciation	193.11%	160.22%
Depreciation/Net Plant	6.30%	6.43%
Capital Expenditures/EBITDA	54.72%	66.64%
Deferred Taxes/Capital Expenditure	5.12%	5.54%





Using the simulated EV/EBITDA ratio, sensitivity analysis with respect to different terminal periods, different fade periods and different assumptions with respect to the ability of a company to realize profits in excess of their cost of capital over long periods can be performed.

In developing the implied EV/EBITDA ratio rather than the implied P/E ratio from value drivers and transition periods, the process involves a table of net invested capital rather than the equity balance. As described in the previous part of the chapter, the invested capital can be evaluated using either a table of assets or a table of financing obligations including equity and net debt – recall that one can begin with common equity and net to compute invested capital or one can begin with net plant, goodwill, net working capital and deferred taxes. The process of computing the EV/EBITDA ratio works best using the asset side of the balance sheet rather than financing obligations. Net assets grow by capital expenditures and net working capital changes and the net assets are reduced by deferred tax changes. To demonstrate the mechanics of the process, the discussion begins by assuming no working capital or deferred taxes and that the factors listed below are known (derivation of each of the factors from the book life, the growth rate in assets, the tax life and the income tax rate):

- Return on Invested Capital
- Weighted Average Cost of Capital
- Capital Expenditures to Depreciation
- Depreciation Rate on Net Plant

The first step of the analysis is computing the investment balance as illustrated in the table below which is analogous to computing the balance of the equity capital. In the case of net investment, the balance decreases from depreciation expense and it increases from capital expenditures. The depreciation expense can be calculated from the opening balance multiplied by the net depreciation rate. Once the depreciation is known, the capital expenditures can derived from multiplying the amount by the ratio of capital expenditures to depreciation.

Investment Balance										
Investment	Prior Balance	1,000.00	1,030.00	1,060.90	1,092.73	1,125.51	1,159.27	1,194.05	1,229.87	1,266.77
Less: Depreciation	Inv x Rate	60.00	61.80	63.65	65.56	67.53	69.56	71.64	73.79	76.01
Plus: Cap Exp	Dep x Cap Exp	90.00	92.70	95.48	98.35	101.30	104.33	107.46	110.69	114.01
Ending Investment	Sum	1,030.00	1,060.90	1,092.73	1,125.51	1,159.27	1,194.05	1,229.87	1,266.77	1,304.77
ROIC	Input	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
NOPLAT = EBIT x (1-t)	ROIC x Beg Bal	120.00	123.60	127.31	131.13	135.06	139.11	143.29	147.58	152.01
EBIT	NOPLAT/(1-t)	171.43	176.57	181.87	187.32	192.94	198.73	204.69	210.84	217.16
Taxes	EBIT x Taxes	51.43	52.97	54.56	56.20	57.88	59.62	61.41	63.25	65.15
Depreciation	Above	60.00	61.80	63.65	65.56	67.53	69.56	71.64	73.79	76.01
EBITDA	EBIT + Depreciation	231.43	238.37	245.52	252.89	260.47	268.29	276.34	284.63	293.17

Once the net investment balance is computed, the NOPLAT or net operating profit less adjusted taxes can be computed as the rate of return on invested capital multiplied by the opening balance of the investment. Because NOPLAT is equal to EBIT x (1-tax rate), the EBIT can be derived as the NOPLAT/(1-tax rate). After computing EBIT, the depreciation expense that has already been computed can be added to derive the EBITDA. With EBITDA, EBIT, the tax rate and capital expenditures, items for cash flow are available. The present value of cash flow is the enterprise value and the EV/EBITDA can be computed as illustrated below.

Computation of EBIT and EBITDA												
NOPLAT = (EBIT * (1-t)) = ROIC x Investment		115.0	114.3	113.9	113.8	114.1	103.1	94.7	88.7	85.0	83.8	86.0
EBIT = NOPLAT/(1-t)		176.9	175.8	175.2	175.1	175.5	158.6	145.7	136.5	130.8	128.9	132.3
EBITDA = EBIT + Depreciation		243.6	242.1	241.3	241.1	241.6	225.1	212.6	204.0	199.3	198.7	204.0
Ratio of Cap Exp to EBITDA		25%	26%	27%	28%	29%	32%	36%	40%	44%	49%	50%
Free Cash Flow												
EBITDA		243.6	242.1	241.3	241.1	241.6	225.1	212.6	204.0	199.3	198.7	204.0
Less: Taxes on EBIT		61.92	61.54	61.33	61.29	61.42	55.52	50.99	47.77	45.79	45.10	46.30
Less: Capital Expenditures		60.45	62.89	65.42	68.06	70.80	73.12	76.61	81.58	88.44	97.70	102.15
Free Cash Flow		121.22	117.65	114.51	111.76	109.39	96.42	84.98	74.66	65.07	55.85	55.50
Valuation												
Discount Rate		6.50%	6.50%	6.50%	6.50%	6.50%	6.18%	5.97%	5.87%	5.88%	6.00%	6.00%
PV Factor		0.94	0.88	0.83	0.78	0.73	0.70	0.67	0.63	0.60	0.56	0.53
Enterprise Value	1,992.68											
EV/EBITDA	8.18											

Subsequent discussion delves into the issues involving how to derive the depreciation rate as a percent of net plant and how to compute the ratio of capital expenditures to depreciation. In addition, the next section addresses how to add deferred taxes and working capital to the analysis. After including these items, the EV/EBITDA ratio can be derived from the lifetime of plant, the tax depreciation life and method, the growth rate in assets, and the ratio of working capital to net plant as illustrated on the above figure that shows the implied EV/EBITDA ratio assuming different drivers.

Comparison of Implied Multiples with Alternative Methods

In setting up a model to derive the EV/EBITDA the first step after computing growth rates, returns and the cost of capital as described above is to recognize that in order to grow, the investment in plant must increase. For example, if a manufacturing firm is to increase sales by 5% and it is operating at full capacity, then the capacity must increase 5%. If capacity increases by 5% and the price of adding capacity remains constant, then the gross investment balance must also increase by 5%. To model investments, the beginning gross investment balance must be entered. If the model does not explicitly account for retirements, the construction expenditures are the difference between the beginning and ending balance of the gross investment.

The drivers of the EV/EBITDA ratio include growth rates, returns, risk premiums, the tax rate and the inflation rate. Instead of using return on equity and cost of equity as in the P/E discussion above, the

EV/EBITDA is driven by the return on invested capital and the weighted average cost of capital. Computation of the EV/EBITDA could be made with and without an adjustment for retirements. Differences between the analysis of EV/EBITDA and the P/E ratio involve taxes, depreciation and net investment rather than equity. Once growth rates, transaction factors, returns and cost of capital are computed, differences involve computation of income taxes, depreciation, capital expenditures, EBITDA and free cash flow.

Book Life (Asset Replacement)	25
Tax Life	10
Tax Rate	23.00%
Working Capital to Plant	11.00%
Transition Years - Growth	11
Transition Years - ROIC	7
Transition Years - WACC	5
Short Term Period	7

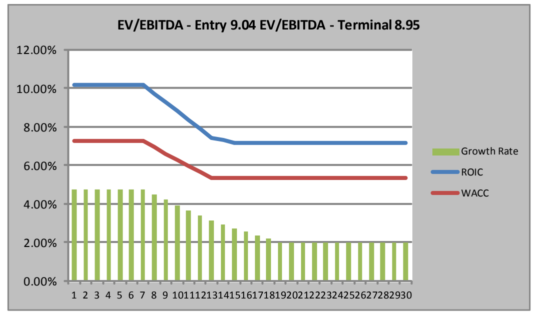
Sensitivity

LT = ST

Reset

	Current	Long-term
ROIC	10.19%	7.18%
WACC	7.25%	5.33%
Growth	4.75%	2.01%

Year of Valuation	1	7
EV/EBITDA - Theoretical	**9.04**	**8.95**
EV/EBITDA - Value Driver	11.02	12.17
EV/EBITDA - Growth Rate	11.02	11.00



Chapter 38: Regression Analysis of P/E, EV/EBITDA, Market to Book Ratio to See if the One Can See Relationships in Real Data

Include M/B Discussion from Chapter 4

After establishing theoretical discussion of multiples, the theoretical drivers of the DCF model and multiples can be tested using actual data with regression analysis. The practical application of such regression analysis is to apply real data on estimated growth, return and measurable cost of capital factors to arrive at multiples that can be applied in the DCF model. The final part of the chapter discusses technical issues associated with the treatment of items should be included in the bridge between equity value and enterprise value.

The above analysis demonstrates various factors that should affect P/E, EV/EBITDA and M/B multiples. When evaluating the P/E ratio or the EV/EBITDA ratio one can test whether these factors in fact influence the ratio. For example, if ROE is higher, the P/E ratio should increase and one should be able to partially predict the differential P/E from the differential ROE. This section describes how actual comparative data for an industry can be used in the analysis. The objective is ultimately to come up with a formula to predict the P/E, EV/EBITDA and M/B ratio from value drivers such as the growth rate, the return on capital, beta, the debt to capital ratio and other factors. If a formula can be established, then one can plug in independent estimates of return, growth and other items and then one can predict the valuation multiples derive the estimated value. For example, the formula could take the form:

P/E = A + B x g/ROE + C x g + D x beta + E x debt to capital + F x Size + G x Country Risk

With such a formula, one can try to explain why the P/E ratio of a company is relatively high or low. Further, if one believes that ROE is above market expectations or the growth rate is lower or the risk is increasing, the P/E ratio can be estimated from the formula. In addition, the analysis can be used to test which factor is most important in the market such as whether the predicted growth rate from stock analysts is more important than historic achieved growth rates. Similar equations can be developed for

the EV/EBITDA ratio where the ROIC would replace the ROE and revenue growth would replace the earnings growth and depreciation rates, tax rates and working capital ratios would be included.

In order to develop a regression, the following step by step approach can be developed. For each step, practical details are discussed.

- Gather data (discuss workbooks.open method)
- Compute ratios (problems with write-offs)
- Adjust data for outliers
- Compute regression

The primary items of free cash flow – EBITDA, operating taxes, working capital and capital expenditures can all be handled in a more careful manner than this standard assumption. A summary of how assumptions can be derived for the period after the explicit cash flow period – period t+1 -- is listed in the table below:

FCF Component	Classic DCF	Problems	Improved Approach
EBITDA	Grow Final Year Cash Flow at Low Growth Rate	Growing the Final Year Ignores the Implicit Return on Investment in the EBITDA and the Relationship Between Cap Exp Growth and EBITDA Growth	Compute the Theoretical EV/EBITDA Driven by ROIC, Capital Expenditures/Depreciation, Tax Rate and Depreciation Rate
Working Capital	Grow at Final Year	If Revenue and Expense Growth Rates are Changing, the Growth Rate in Working Capital will not be Correct by Simply Applying the Terminal Growth to the Final Year Working Capital	Model and Additional Period After the Last Explicit Year, Where the Revenues and Expenses Grow at the Terminal Growth
Capital Expenditures	Either Use the Final Year Capital Expenditures or Set Capital Expenditures Equal to Depreciation	There is a Theoretical Relationship between Capital Expenditures and Depreciation that Depends on Growth and Depreciation Rates; this Growth Rate Does Not Equal 100% Unless there is No Growth	Compute the Equilibrium Capital Expenditures to Depreciation by Making a Simple Model that Extends for Many Periods. This Model is a Function of the Plant Life and the Growth in Capital Expenditures
Taxes	Apply EBIT x Tax and Ignore Deferred Taxes	Deferred Taxes Reach and Equilibirum Level that Should be Consistent with Cap Exp Growth	Compute Equilibrium Deferred Taxes as Function of Tax and Book Depreciation Rates and Income Tax Rate using a Similar Method as Above, with a Long-term Model that Reaches Equilibrium

Chapter 39: Bridge between Enterprise Value and Equity Value in the Discounted Cash Flow Model

This chapter discusses practical issues in measuring the difference between equity value and enterprise value discussed above when introducing the discounted cash flow (where the only difference was assumed to be net debt.) Liabilities or assets other than net debt create a difference between enterprise value (measured as the present value of free cash flow) and the equity value that actually accrues to shareholders. This difference between equity and enterprise value defined below as the bridge arises in situations other than net debt when computing value with the discounted cash flow method. One other instance is computing enterprise value from market capitalization for purposes of calculating the EV/EBITDA ratio used to establish value from comparable companies. Another case is computing the invested capital from the common equity investment on the balance sheet when computing the return on invested capital. A third case is computing the implied enterprise value in an acquisition given the consideration paid for the common shares of a target company.

Items that should be included in the bridge vary depending on objectives of the computation. In order to determine which items should be included in the bridge between enterprise value and equity value or between invested capital and equity capital, it is important to understand what is included in free cash flow and how the various assets and liabilities affect cash flow to equity holders.

Equity Value from Enterprise Value when Using the Discounted Cash Flow Model

When computing equity value and enterprise value in the discounted cash flow model, a number of adjustments may be required for various assets and liabilities that are not directly or indirectly included in free cash flow and the enterprise value. The central issue in assessing whether an adjustment should be made in various instances is to work through each item on the balance and determine the following:

1. Does the asset produce cash flow to equity owners that is not directly or indirectly already measured in the free cash flow (EBITDA) that is used to measure enterprise value;

2. Does the liability result in cash outflow made by equity owners that is not directly or indirectly measured in free cash flow (EBITDA) and enterprise value;

If the above conditions are met, the item should be included in the bridge between computed enterprise value and equity value. In valuation analysis, the amount of the asset or liability adjustment should be the present value of the cash flow not included in the enterprise value that could theoretically be realized by shareholders. This can often be established in theory by pretending that the asset or the liability could be sold at the date of the asset valuation.

To demonstrate how various values are determined, a very simple hypothetical company is used to guide some of the discussion. This company simply purchases risk free treasury bonds and then distributes proceeds from the bond redemption and from the interest on treasury bonds to its common shareholders as dividends. As with many companies, the very simple business became messy because of historic acquisitions and questionable decisions made by its management. Because of attempting to save costs through buying an old building that has caused local protesters to mobilize, the company has been embroiled in various different legal battles. Further in borrowing money to buy treasury bonds, the company has not matched the repayment timing of the borrowing with the duration of cash flows that will be realized from the cash proceeds. Other than the basic business, the company has the following:

- Some extra cash on the balance sheet that produces an little income that is not included in free cash flow
- A loan (recorded as a note receivable) to a sister company that is due in three years
- A long-term account receivable that will finally be received as cash by the company in two years which was accompanied by higher revenues for not receiving cash on a timely basis
- An office building that is an eye sore and will have to be dismantled in five years the cost of the dismantling is included as a liability on the balance sheet.
- A potential liability related to lawsuits on the office building that is not recorded on the balance sheet

- Counter lawsuits against the city for condemning the building that could generate cash flow
- A few miscellaneous investments, the income of which is not included in free cash flow
- A pre-paid expense to a lawyer related to the lawsuits
- A parcel of land that is not currently producing income which will replace the current building
- Another parcel of land that has been purchased as plan B, in case the preferred building cannot be constructed
- Accounts receivable related to interest income that has been recorded in-between the semi-annual dates at which payments are received.
- Accounts payable to employees reflecting the fact that the employees are paid only once every three months.
- A long-term accounts payable to one of the legal firms as work has been done, but payments will not be made until the court decision is made.
- Because taxes are recorded on the books when interest is accrued, but taxes are paid later on when payments are received and quarterly tax returns are prepared, a deferred tax liability is recorded on the books.
- The company has been in existence for many years and it has a defined benefit plan which means that former retired employees will receive fixed pre-determined amounts in the future. The company thought it had enough cash in a trust fund to meet the present value of future obligations, but the trust fund assets were invested in stocks that took a big tumble during the financial crisis and it is now not big enough to meet the future obligations.
- The company generally invests in long-term securities that have maturities ranging from two to five years. However it borrows using short-term loans. Because of exposure to increasing interest rates, the company uses swaps to fix some of its interest rate exposure. The company entered into interest rate swaps when the fixed swap rate was high. If the company were to try and sell the interest rate swap, it would realize a loss because other companies can enter into a swap contract at a lower rate. The amount of this loss is recorded as a fair value of derivative liability on the balance sheet.
- The company is separated into ten different subsidiary companies. One of these companies is owned in part by a joint venture partner. This company has performed worse than any of the other subsidiary companies and the investment of the joint venture partner is included as minority interest on the balance sheet.
- The company was purchased from another company three years ago. Due to purchase accounting, the company recorded goodwill and increase in plant value and intangible assets related to customer lists on its books. In addition, a large deferred tax liability was recorded to reflect the fact that the intangible assets and the increase in plant value that were booked during the acquisition.
- The company pays many of its employees through stock-based compensation rather than through cash.

In computing the enterprise value, it is assumed that the company carefully computes the opportunity cost for investing in treasury securities that have different tenors (the company uses interest income in EBITDA which would not be consistent with the rule written in many textbooks, but this is the fundamental business of the company). As the cost of capital is the return that could be realized on investments with similar risk, the company computes the rate of return that could be earned on each tranche of the treasury securities and then it weights the average. For example, if the company only owned two treasury bonds, and one of the bonds had a long-term maturity of thirty years and the other bond had a maturity of two years, then the weighted average cost of capital should be the current return that could be earned by an investor in the thirty year bond and the two year bond. The weighting would in turn depend on the market value of the two bonds. This is the definition of cost of capital and for once it is not ambiguous.

The example is intended to illustrate many of the balance sheet items and contingent assets and liabilities that may or may not be included in the bridge between equity value and enterprise value. Through assuming the company invests (probably on an inefficient basis) in treasury bonds, the weighted cost of capital should be less ambiguous than for a company investing in other types of real assets.

Bridge between Enterprise Value and Equity Value when Applying DCF Calculation

The first situation discussed is what items to include in the bridge between enterprise value and equity value when computing value using the discounted cash flow model.

Surplus Cash

Short-term Accounts Receivable and Inventory

Long-term and Short-term Notes Receivable and Long-term Accounts Receivable

The manner in which the notes receivable and other investments should be included in the WACC calculation depends on the way in which discount rates are adjusted for the notes receivable. For example, when betas de-leveraged are re-leveraged, if the notes receivable are included in the process of de-levering betas, then the notes payable should be included as a negative number in the WACC calculation. In this case, the cost of capital associated with the notes receivable should be the rate of return that could be realized from lending to the company in given its credit quality and the terms of the loan. The example below illustrates how a company with an asset beta of 1.30 implies that the measured equity beta is 1.06 because of the notes receivable. To make the adjustment to WACC, the notes receivable should be included as a negative item in the WACC in order to appropriately measure the cost of capital associated with free cash flow.

	Market Value	Beta
Notes Receivable	200	-
Other Assets Generating Free Cash Flow	900	1.30
Total Assets	1100	
Equity	1100	

Cost of Capital for Assets and Equity	Equity	Assets
Beta	1.06	1.30
Risk Free Rate	4.00%	4.00%
Equity Market Risk Premium	5.00%	5.00%
Equity Cost of Capital	9.32%	10.50%

WACC	Amount	Percent	Cost	WACC
Notes Receivable	-200	-22%	4.00%	-0.89%
Equity	1100	122%	9.32%	11.39%
Total	900			10.50%

Long-term and Short-term Prepaid Expenses

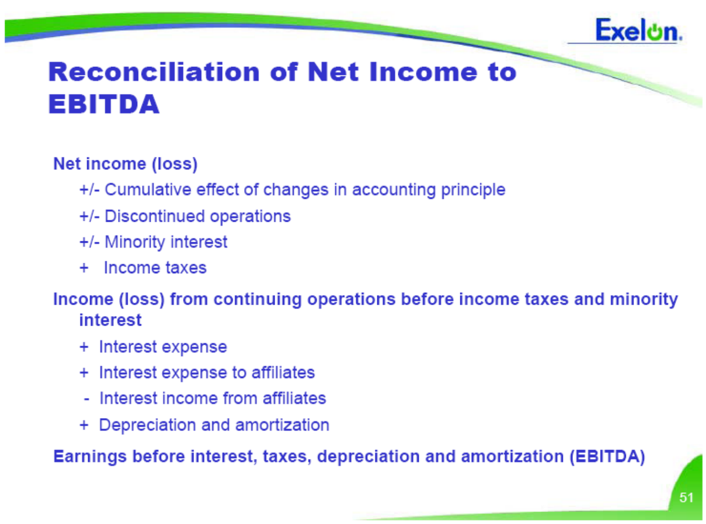
In the example above, a pre-payment was assumed to be made to a lawyer for expenses that have not yet been incurred. If the expense – e.g. the trial – occurs within a year, then the pre-paid expense would be classified as current asset, while if the expense occurred after a year the pre-paid expense would be classified as a long-term asset. If the expense associated with the trial is included as a cash outflow in the EBITDA, free cash flow and enterprise value calculation (even though it will not really be paid), then the prepaid expense should be added to the bridge between equity capital and enterprise value. This is because the expense included in the free cash flow that makes the cash flow seem lower because of the cash flow to the lawyer that will not actually be paid. As the enterprise value is artificially lowered by the expense that is not actually a cash outflow, a correction should be made and the extra cash flow from prepayment should be somewhere in the valuation. The place to put this correction is in the bridge between equity value and enterprise value. (In theory the pre-paid expense should be valued as the present value of the expense.) On the other hand, if the legal for the trial is not separately included in the free cash flow because it has already been paid, then the pre-paid asset should not be included in the bridge. If the prepaid expense is in cash flow, the cash flow and the enterprise value correctly measures the enterprise value and no adjustment is necessary. The treatment of prepaid expenses demonstrates the importance of understanding what is implicitly or explicitly in the cash flow. If the pre-paid expense is related to taxes or other items that occur on an on-going basis, then the cash flows generally include the expense as an assumed cash outflow, but the pre-paid expense must be repaid as the previous expense is made. With a growing company this asset is never realized as cash by the equity investors even if the full expense is included in cash flow. Therefore, the prepaid expense should not be included in the bridge similar to the case with accounts receivable. In summary, current pre-paid expenses should not be included in the bridge and long-term one-off prepaid expenses should only be included at the present value of the expense if the expense is not included as an operating expense in the cash flow.

On the liability side of the balance sheet, the principle is similar for deferred expenses, except that payments have not yet been made and the accrued expense has occurred. For example, resource companies may have an account named accrued reclamation costs to measure the future expenditures that will be incurred for cleaning up a site after its productive life. If cash flow associated with this future liability is not included in free cash flow (for example as a future capital expenditure or operating expense) then the item does reduce value for equity investors. In this case, the present value of future expenditures should be included as an adjustment to enterprise value in computing the equity value. On the other hand, if the future expenditures are included as part of cash flow (probably many years into the future), the liability is already incorporated in free cash flow and enterprise value implying that no adjustment should be made.

Land and Other Assets not Currently Producing Cash Flow

Other Non-Associated Investments, Discontinued Operations and Long-term Investments

Long-term investments for which the income is not included in free cash flow should be included in the bridge between enterprise value and equity value as should generally be treated in the same way as the surplus cash. The fact that some investments are due in one year and others are expected to be held for longer periods makes no difference as to whether the investments should be included in the bridge. An exception to this is if the investments are held to pay a future liability such as the decommissioning of a nuclear plant. In this case either both the liability and the investment should be included or neither the liability nor the investment should be part of the bridge between enterprise value and equity value. Investments in non-associated companies and other investments should be treated in the same way as the long-term investments and the surplus cash as long as the income associated with these investments is not included in EBITDA and the free cash flow. On the other hand, if the income from other non-associated investments is included in the free cash flow and therefore included in the enterprise value, it would clearly be double counting to also include the investments as a bridge between enterprise value and equity value. The computation of EBITDA is not consistent among analysts, which means treatment in the bridge can be different. Sometimes calculation of EBITDA begin with revenues and cash expenses or begin with operating income and add back depreciation expense thereby excluding income from non-associated investments. This approach means that EBITDA, free cash flow and enterprise value concentrates on the business activities of the firm and excludes equity income from non-associated investments. Here, as income and cash flow from non-associated investments is not included in enterprise value, and it follows that the value should be included in somewhere else; namely in the bridge between equity value and enterprise value. On the other hand, some analysts compute EBITDA literally which means that one begins with earnings and then adds back depreciation, amortization, total net interest expense and taxes as shown below. In this case, income from non-associated investments is implicitly included in EBITDA, free cash flow and enterprise value. The treatment of non-associated investments in the bridge between enterprise value and equity value depends on the way the income is treated. If non-associated income is included in EBITDA, free cash flow and enterprise value, then In the example above, a pre-payment was assumed to be made to a lawyer for expenses that have not yet been incurred. If the expense – e.g. the trial – occurs within a year, then the pre-paid expense would be



The treatment of assets, income and losses that are classified as discontinued operations is generally analogous to income from non-associated investments where the non-associated investments are not included in EBITDA, free cash flow and enterprise value. The income or losses from discontinued operations should not be included in EBITDA and the value of the discontinued operations should be at market value. If the value of discontinued operations is included in the bridge between equity cash flow and enterprise value, then the cash flow forecasts should not include proceeds from the sale of the discontinued operations. Instead, the discontinued operations should simply be stuck on the balance sheet in the forecasts. As with surplus cash, if the cost of capital is computed through either directly or indirectly accounting for the risk of non-associated investments, long-term investments and discontinued operations should in theory be included as a negative item in the WACC. Assume that the discontinued operations were a very risky activity and the continuing operations have low risk. When using historic volatility to gauge the cost of capital and the risk, the free cash flow will have a low value if no adjustment is made in the WACC for the higher risk discontinued operations. The manner in which discontinued operations should theoretically be adjusted in the WACC is illustrated in the table below. In this case, the WACC estimated from historic analysis of the stock including discontinued operations is assumed to be 11.6%. Through somehow knowing the cost of capital of discontinued operations is 20%, one can derive the cost of capital of 6% that should be applied to free cash flow from continued operations. In theory similar adjustments should be made for long-term investments and for equity investments in non-associated companies.

WACC Adjustments for Discontinued Operations

Cost of Capital Assumptions				
Cost of Capital for Continuing Operations	6%			
Cost of Capital for Discontinued Operations	20%			
Value Assumptions				
Value of Discontinued Operations	200			
Total Equity Value	500			
Weighted Average Cost of Capital - Historic	Value	Percent	Cost	WACC
Discontinued Operations	200	40%	20%	8.00%
Continuing Operations	300	60%	6%	3.60%
Total	500			11.60%
Adjusted WACC for Continuing Operation	Value	Percent	Cost	WACC
Equity Value	500	167%	11.60%	19.33%
Less: Discontinued Operations	-200	-67%	20.0%	-13.33%
WACC for Contining Operations	300			6.00%

Debt, Debt Issuance Costs, Derivative Assets and Liabilities Associated with Hedging Interest Rates

Debt is generally the primary item in the bridge between enterprise value and equity value as the interest rate and repayment of debt is not included in free cash flow and enterprise value, but it must be incurred by equity investors. The primary question related to debt is how to make a valuation of debt for purposes of the bridge. Issues associated with valuing debt include (1) whether market value or book value should be used; (2) if debt issuance costs (an asset on the balance sheet) should be deducted from the debt balance; (3) how should derivative assets and liabilities associated with the valuation of interest rate swaps and exchange rate hedges be included in the bridge between equity value and enterprise value; 4) should adjustments be made for prospective changes in the capital structure; and, (5) how should the value of debt be adjusted if an acquisition changes the risk associated with the debt. The most precise way to account for debt would be to measure the future cash flow obligations that arise from the debt and value those obligations at the opportunity cost of debt. The opportunity cost of debt should in theory be measured using a discount rate that reflects the risk associated with probability of default and loss given default associated with the free cash flow. As the option value of lending increases with more debt in the capital structure, the option value of equity should decline and in theory the overall cost of capital should not change. If loans have been made at different fixed rates than the opportunity cost of debt capital (which includes debt fees paid to bankers and bond underwriters), then this difference in value should be included in the bridge between equity value and enterprise value. If debt is traded in the market, the value of the debt should reflect the opportunity costs of lending at current rates and it should be used in the bridge. However, the market value should be reduced to account for arrangement fees that must be paid by equity holders as new debt is issued to finance on-going capital expenditures of the company.

In practice, computing the market value of each separate debt issue where differences in credit spreads for debt issues with different durations; differences in the yield structure of different debt issues; reflection of interest rate swaps for each issue; and inclusion of debt fees in the cost of debt capital is not practical. Instead, if the interest rate on most debt issues is reasonably similar to the interest rate that would be incurred on new debt issues or if most debt issues have variable interest rates, then the market value of debt is assumed to be approximately the same as the value of debt on the balance sheet. If this assumption that the market value equals the book value is made, then it is appropriate to make other adjustments in the bridge between equity value and enterprise value. The first adjustment is that debt issuance costs should be included as a reduction in the value of debt which is similar to assuming that the debt cost of capital incudes fees. The second adjustment relates to valuation of derivative assets or liabilities on the balance sheet related to interest rate swaps or exchange rate swaps related to debt issues. In the case of interest rate swaps, the valuation of these derivatives reflects fixed interest rates that are higher than prevailing interest rates – a derivative liability – or interest rates in swap contracts being below the prevailing interest rate – a derivative asset. In a sense the valuation of derivative contracts moves the book value of debt on the balance sheet towards the market value. Indeed, if all of debt on the balance sheet had associated interest rate swaps, then adding derivative liabilities and/or deducting derivative liabilities would be an implicit way to reflect market value rather than book value in the bridge between equity value and enterprise value. Unfortunately, of course, some debt issues will probably have fixed rates that are not valued as derivatives. In sum, there are two ways to attempt to reflect the market value of debt in the bridge. The first method is to make a detailed issue by issue market value analysis of debt where the current cost of debt, current credit spreads and current fees are all included in the analysis. If this method is used, then adjustments for the value of debt issuance costs and derivatives should not be made. The second method is to use the book value of debt on the balance sheet and make add or subtract derivatives and debt issuance costs.

A final issue in valuing net debt occurs in an acquisition scenario where the credit quality of a company suddenly changes because of an acquisition or some other re-structuring. If the capital structure is being changed as part of a transaction, the debt should be re-valued to reflect the new level of credit risk. For example assume a company had a liquidity crisis during the financial crisis and had to issue debt at a very high fixed interest rate. If the company that issued the fixed rate debt is purchased by another company that has a strong credit rating, the opportunity cost of debt could decline dramatically. The correct valuation of debt in this case is the value using the new credit spread. In the transaction, the value of debt has increased and the value to the equity holders has declined.

Derivative Assets and Liabilities Associated with Hedging Commodity Prices and Other Items

The discussion above addressed derivative contracts associated with interest rate swaps and exchange rate swaps. Additional derivative assets or liabilities may be generated from commodity price hedges. For example, assume that a company entered into contract to fix the price of oil at very high prices in the middle of 2008 when the price was US$ 147 per barrel. At the end of 2008, the oil price had declined to about US$ 40 per barrel. As the company could realize US$ 147 per barrel from selling oil and buy oil for US$ 40 per barrel, the contract would have had positive value. The question of how value from hedging contracts such as this should be included in valuation of the company depends on how the contract is modeled in the free cash flow calculation. If the hedging contracts are modeled as part of free cash flow, the value of the derivative contracts should not be included in the bridge between equity value and enterprise value. On the other hand, if the hedging contract is not explicitly included in the free cash flow calculation, then the value of the derivative contracts should be included in the bridge.

To demonstrate the principle of valuing derivative contracts, assume that one company signed a favorable contract and another company signed a disadvantageous contract. If the two companies are identical in every other way, the company that signed the advantageous contract should have higher value than the company with the disadvantageous contract. If the contract is modeled as part of free cash flow – for example the company with the advantageous contract realizes higher future revenues – then the increased value is already reflected in free cash flow and enterprise value. On the other hand, if the free cash flow calculation is made at assumed future spot prices, the enterprise value will be the same for both companies. If the value is already included in the enterprise value of the company, the value of the derivative contracts should not be added to enterprise value. If the value of the derivative contracts is not in the enterprise value, the value should be included in the bridge between enterprise value and equity value.

Preferred Stock, Minority Interest and Other Financing Instruments

Preferred stock, minority interest and other instruments used to finance the enterprise should be treated in a similar manner to debt. The fact that the instruments should be valued at market value reflecting the current value of claims on the cash flow should be clear from the discussion of debt. For example, if minority shareholders own 49% of a company, then they should be allocated 49% of the enterprise value no matter what is the minority interest on the balance sheet. Similarly, if a preferred stock instrument has a fixed interest rate plus some kind of equity kicker, the preferred stock should be measured at market value that depends on the risk and the prospective cash flow of the instrument. As with debt and assets discussed above, the minority interest and the preferred stock should be included in the WACC calculation. For example if minority interest represents 49% of the company, it should be included at market value in the WACC just like the debt. Assume a second company has no minority equity and the same enterprise value, implying that the amount of debt is higher. The example demonstrates that company with the minority interest should have lower volatility and lower cost of equity capital because of the relatively lower amount of debt. To derive the appropriate cost of capital that should be used in measuring the value of free cash flow, the minority interest should be included in the WACC calculation which effectively increases the equity percentage and lowers the cost of capital.

As in the case of debt, in practical situations valuing the minority interest may be complex because of the lack of market data. Alternatives include applying a P/E ratio to the income attributed to minority interest or to use the ratio of minority interest to common equity in establishing value. To apply the latter method, one can compute total value of minority and common equity and then split the equity into the common equity portion and the minority equity portion.

Current Liabilities and Long-term Payables

Unfunded Pension Liabilities

Unfunded liabilities on the balance sheet arise because of defined benefit pension plans that companies provide to their employees where the amount of benefit is defined and does not vary as a function of financial market returns. The amount of money that must be paid in future is computed at its present value and compared to amounts that are held in a trust fund to pay the future expenses. If the amount in the pension trust fund is below the present value that must be paid to employees, then a liability is recorded on the balance sheet. Unfunded pension obligations are liabilities that must eventually be repaid by shareholders and the cash outflow associated with putting money into the trust funds is generally not included as a cash outflow in the free cash flow calculation. The company could borrow money to fully fund the pension trust fund and eliminate the liability implying that the unfunded liability should be treated as debt in both the bridge between equity value and enterprise value and in the WACC calculation. To illustrate this, consider an example of two identical companies in every respect except that one company funds its pension plan while carrying debt on its balance sheet while the other company does not fund the pension plant. For these two companies, both the enterprise value and the equity value should be the same as one company has simply chosen a different financial strategy. If the cash flow declines, then debt leverage aggravates the decline from the standpoint of equity owners implying the cost of equity is higher with leverage. In the same way, if a company has an unfunded pension plan, that fixed obligation magnifies the effect of reductions in cash flow to equity owners in the same way as fixed obligations from debt.

As with other issues, where an item is included in the bridge between equity capital and enterprise value, the item should also be included in the WACC calculation. If a company is not fully funding its pension plan, one could think of the company borrowing from the pension trust fund. There is no economic difference between borrowing money from a bank and borrowing money from the trust fund. In theory, the discount rate used in valuing future obligations should be relatively low reflecting the fixed nature of the obligations. A relatively low discount rate also increases the pension liability on the balance sheet. If a low discount rate is used, the pension obligations should also be included as a component of the WACC at that discount rate. If a high discount rate would be used, the liability would be undervalued. To offset the undervaluation of the pension obligations, the higher discount rate could be used in the WACC calculation.

Accumulated Deferred Taxes

Stock Options

In making a valuation using the discounted cash flow model, the objective of valuation is measurement of the value per share to common shareholders. If stock options have been granted to management as part of their compensation package, exercise of the options increases the number of shares without providing additional capital. These stock options can spread the equity and enterprise value over more shares and reduce the value per share to existing common shareholders. To illustrate the treatment of stock options, consider a hypothetical example of two companies that are identical in every way, except that one company pays its executives with cash and another company pays its employees through stock options. The difference in method of payment should not affect the value to common shareholders. The company that pays its executives which stock options has more cash because of not paying its employees, but it also has more cash and a higher equity balance. The stock options are accounted for as operating expenses implying that the EBITDA and the free cash flow should be the same for both of the companies. However, the equity value of the company with stock options appears to be higher because of the increased cash (or decreased debt) on its balance sheet.

To adjust for the value of stock options, two approaches can be adopted as illustrated on the table below. The first approach is to divide the equity value by the diluted shares rather than the basic shares. The second approach is to quantify the value of stock options and include the value of the stock options as a deduction when adjusting the enterprise value. When using the second approach, the equity value should be divided by the basic shares rather the diluted shares. Details of stock options in terms of the number of options, exercise prices and expiration dates are often presented in notes to financial statements. With this information it is quite easy to compute the value of stock options using different volatility, stock price and interest rate assumptions.

Valation of Stock Options

	Pay Executives with Cash	Pay Executives with Stock
Profit and Loss, Free Cash and EV		
Revenues	1,000	1,000
Operating Expense - Cash	400	0
Operating Expense - Stock Options	0	400
EBITDA	600	600
WACC	10%	10%
Enterprise Value assuming Constant	6,000.00	6,000.00
Balance Sheet		
Cash	100.00	500.00
Other Assets	5,000.00	5,000.00
Total	5,100.00	5,500.00
Equity	5,100.00	5,500.00
Valuation with Diluted Shares		
Value of Common Equity (Incl Cash)	6,100.00	6,500.00
Common Shares - Basic	100.00	100.00
Value per Share	61.00	65.00
Added Shares	-	6.56
Diluted Shares	100.00	106.56
Value per Diluted Share	61.00	61.00
Valuation using Stock Grant Value in Bridge		
Value of Stock Grants	-	400.00
Enterprise Value + Cash - Stock Grants	6,100.00	6,100.00
Adjusted Value per Basic Share	61.00	61.00

Accumulated Other Comprehensive Income

Accumulated other comprehensive income arises because some assets on the balance sheet such as derivative liabilities are not recorded on the income statement. Other items are related to currency translation gains or losses whereby financial assets are translated to a different currency. No valuation is generally required for accumulated other comprehensive income as items such as derivative assets have already been discussed. The foreign translation adjustments should also already be reflected in the market value of debt and equity.

Summary

Given the length of this section, a summary of the different items is presented below.

Summary of Treatment of Balance Sheet Items in the Bridge Between Enteprise Value and Equity Value			
Balance Sheet Item	**General Treatement in Bridge**	**Theoretical Treatment in WACC**	**Comments and Difficulties**
Surplus Cash	Include as Negative	Include in WACC	WACC treatment depends on Cost of Equity Calculation
Operating Cash	Exclude	Exclude	Could argue that operating cash has same treatment as surplus cash
Short-term Accounts Recievable and Inventory	Exclude	Exclude	Implicit financing income from A/R in EBITDA
Long-term Notes Receivable and Accounts Receviable	Include if One-Time Event	Include as Negative	Exclude if redemption is included in free cash flow
Deferred Expenses and Prepaid Expenses	Exclude if Expense Reflects Cash	Exclude	Include if operating expense is not reduced to reflect cash
Assets not currently producing cash flow	Include at Market Value	Adjust WACC	Exclude if effect of assets in capital expenditures or in assets sales
Non Assocaited Investments	Include if income not in EBITDA	Adjust WACC	If non-associated income is in EBITDA, exclude from bridge
Discountinued Assets and Liabilities	Include if assets sales not in Cash Flow	Adjust WACC	If asset sales included in free cash flow, exclude from bridge
Debt	Include at Market Value	Include in WACC	Could be at book value if include derivative liabilities
Unfunded Pension Obligations	Include at Balance Sheet Value	Adjust at Discount Rate	Liabilities should be valued similar to debt interest rate
Long-term payables	Similar to Long-term Notes Receivable	Adjust WACC	Depends if the payables are one-off and included in cash flow
Accuumlated Reclamation Costs	Include if No Associated Investments	Adjust WACC	Unless cash flow includes outflows or trust fund investments
Derivative liabilities (assets) related to interest rate swaps	Exclude if Debt at Market Value	Exclude	Could include if debt is valued at book
Derivative liabilities (assets) related to foreing exchange swaps	Exclude if Debt at Market Value	Exclude	Could include if debt is valued at book
Derivative liabilities (assets) related to commodity hedges	Include if Not in Cash Flow	Adjust WACC	If contracts modelled in cash flow, exclude from bridge
Preferred Stock	Same Treatment as Debt	Include in WACC	Market value depends on assumed cost of capital
Minority Interest	Include at Market Value	Include in WACC	Can compute proportion of value owned by minority interest
Accumulated Deferred Taxes	Exclude and Model Changes in Cash Flow	Exclude	Should compute statble level of deferred taxes in terminal value
Stock Options	Exclude and Divide by Diluted Shares	Adjust WACC	Can directly compute value of stock options and include in bridge

Adjustments in Computing EV/EBITDA Ratio

When computing the EV/EBITDA ratio for a company, calculation of the enterprise value implies that the bridge between equity value and enterprise value must be included as the equity value is known but the enterprise value must be derived. For example, in computing the implied EV/EBITDA ratio in an acquisition, one would typically begin with the consideration in the acquisition or the amount paid for the equity of the company being purchased. To arrive at enterprise value from the equity value, the same sort of adjustments should be made as those described above for computing the bridge between discounted cash flow are required.

From a theoretical perspective, the adjustments in computing the equity value from the enterprise value discussed above are no different from beginning with the market capitalization. However, many of the issues in considering the bridge were ambiguous and depend on the computation of EBITDA and free cash flow. For example, inclusion of the value of non-associated assets in the bridge should occur if income from non-associated assets is not included in EBITDA. The problem with making all of the adjustments when computing the EV/EBITDA ratio is that the reason for computing the ratio in the first place is to make comparisons with other companies and/or other transactions. If the enterprise value is computed in a very precise manner considering all of the adjustments discussed above, but the comparison sample is computed in a different manner, the valuation will be distorted. Consider a highly contrived example below where the difference between EV/EBITDA with and without unfunded pension plans is the same for the company as for a comparative sample. In this extreme case, it is better to compute the EV/EBITDA for the company in a consistent manner as for the comparative sample. If the company in question has a different relative amount of unfunded liabilities than the comparative average, then valuation biases will exit.

	EV/EBITDA with Pension Adjustment	EV/EBITDA without Pension Adjustment
Compariosn Companies		
Company A	8.8	8.5
Company B	8.5	8.3
Company C	9.4	9.2
Company D	8.4	8.1
Median	8.65	8.4
Company in Question		
Market Capitalization	3,500	3,500
Net Debt	2,000	2,000
Unfunded Pensions	500	0
Total Enterprise Value	6,000	5,500
EBITDA	694	694
EV/EBITDA with pensions	8.65	8.65
EV/EBITDA w/o pensions	7.93	7.93
Comparison EV/EBITDA	8.65	8.40
Implied Enterprise Value	6,003	5,830
Implied Equity Value	3,503	3,830

In making comparative samples, it would be best if the EV/EBITDA ratio were calculated by carefully including each item at the appropriate market value. If this is not possible, it is essential to understand how the ratio is computed in the sample.

MOVE TO APPENDIX

Free Cash Flow and Weighted Average Cost of Capital

Before addressing detailed and sometimes complex approaches to compute terminal value, valuation multiples and the bridge between equity value and enterprise value, fundamental issues involving how to compute cash flow and calculate discount rates from are reviewed. Most of these concepts – free cash flow, un-leveraged discount rates, and the CAPM – are not generally disputed in academic circles and are covered more comprehensively in many text books.[1] Some of the valuation basics that are now a standard part of financial analysis -- and are in some cases wrong -- are summarized below.

(1) Valuation of an asset or the value of an enterprise should in theory be measured by discounting free cash flow over its remaining life which is generally assumed to be indefinite in the case of corporations. Theorists insist that using alternative measures such as comparative earnings per share, equity cash flow, payback period analysis, or the accounting return on equity are inappropriate (even though the methods are commonly used in practice). The definition of the value of an enterprise which is equal to the value of the debt net of cash balances, equity and other claims on the company (more complex adjustments to net debt are discussed below).

Enterprise (Asset) Value = Equity Value + Net Debt Value

or, using different terms:

Enterprise Value = Market Capitalization + Market Value of Net Debt

[1] Brealy and Meyers, Principles of Corporate Finance, Chapter 12, Irwin/McGraw Hill, 2000.

Where,

Market Capitalization = Number of Shares x Share Price

Net Debt = Value of Long-term Debt + Short-term Debt + Minority Interest – Surplus Cash

(2) The value of net debt in the above equation is the discounted present value of future cash flows received by debt holders – interest and principal payments – measured at a discount rate that reflects the possibility of losing money from a default on the debt. The discount rate for the debt cash flows can be computed as a risk free rate of interest associated with the maturity of each debt issue plus the credit spread that reflects the expected probability of default and the loss given default. Net debt is used rather than gross debt because if a company has extra cash that it does not need for operations, the cash could theoretically be used to pay down debt. (As discussed below, debt obligations increase the risk and the beta for equity, while cash balances decrease risk and the equity beta unless they are invested in risky securities.)

Debt Value = ∑ Present Value (Debt Cash Flow, Discounted at Risk Free Rate plus Credit Spread)

Valuation of debt illustrates that it is the risk of prospective cash flow that drives value and that this risk measurement has nothing to do with the historic interest rates which determine the level of the debt cash flow. In a very simple case for a zero coupon debt issue providing 100 of cash due in ten years where the credit spread is 2% and the risk free rate is 5%, the current value of the debt is 50.36 as demonstrated below. The discount rate is computed as (1+Rf) x (1+credit spread)-1 and the present value is the cash flow divided by one plus the discount rate raised to the tenth power:

Credit Spread	2.00%
Rf	5.00%
Discount Rate	7.10%
Cash Flow	100.00
Present Value	50.36

(3) In an analogous manner to the valuation of debt, the value of equity is the present value of future equity cash flow which can be defined as dividends plus capital gains less new issuances of equity. The discount rate used in computing equity cash flow should be the minimum rate of return required on investments with comparable risk or the cost of equity capital which can also be broken down into a risk free rate and a risk premium. Traditional ways of computing the cost of equity capital are to apply the CAPM or the discounted cash flow model which derives the cost of capital from the long-term expected growth rate in dividends (chapter 4).

Equity Value = ∑ Present Value (Equity Cash Flow, Discounted at Cost of Equity)

Assuming that no dividends are realized on an investment and the stock will be sold in 10 years producing a value of 200 and that the risk premium on the investment is 5.5%, the value of equity is computed in a similar manner as the value of debt illustrated below.

Risk Premium	5.50%
Rf	5.00%
Discount Rate	10.78%
Cash Flow	200.00
Present Value	71.88

(4) Free cash flow is earnings before interest, depreciation and taxes less capital expenditures and working capital changes and it should be computed on an after-tax basis. The total free cash flow is also the sum of the cash flow received by equity investors plus the cash flow received by debt

investors minus the tax shield realized from issuing debt;

Free Cash Flow =
EBITDA – WC Change – Capital Expenditures – Operating Tax + Deferred Tax Change

where,

Operating Tax = EBIT x Marginal Tax Rate

or,

Free Cash Flow = Debt Cash Flow + Equity Cash Flow - Interest Tax Shield

In contrast to equity cash flow (dividends and equity issuances), the free cash flow cannot be plucked from items that are shown on the financial statements. When computing free cash flow, debt financing and income taxes complicate measurement because free cash flow is computed on a hypothetical basis as if no debt were present to finance the asset. The presence of debt increases the variation in equity cash flow for a given amount of variation in revenues and expenses. This implies that if the discount rate applied to equity cash flow should change as the amount of debt financing changes.

(5) The reason the interest tax shield is deducted from equity and debt cash flow in the formula above is that benefits from the value of the tax shield are incorporated in the weighted average cost of capital calculation (the debt cost is computed after the tax shield). The investor value is reconciled through applying a lower WACC that increases the value of the cash flow (one can also think of the formula as reflecting the net cash flow paid to debt holders after deducting tax benefits of debt.) Through not including the tax shield in the free cash flow formula, the free cash flow is less than the cash flow received by equity and debt investors. Because the weighted average cost of capital uses incremental debt cost of capital (the risk free rate plus the credit spread), the value of the tax shield reflects the incremental cost of debt rather than the actual interest deductions. In theory, the difference between the interest tax shield generated by actual interest and the interest deductions generated by the incremental cost of debt in the WACC formula should be included in the bridge between enterprise value and equity value.

(6) Because free cash flow consists of debt and equity cash flows, and the enterprise value is defined as the sum of equity and debt value, the value of the overall free cash flow (the sum of equity and debt cash flow) can be used to derive the enterprise value. This calculation works as long as the discount rate applied to equity cash flow is the cost of equity and the debt cash flow is used in valuing the free cash flow;

Enterprise (Asset) Value =
∑ Present Value (Debt Cash Flow, Discounted at Risk Free Rate plus Credit Spread) +
∑ Present Value (Equity Cash Flow including Tax Shield, Discounted at Cost of Equity)

which should also equal:

Enterprise (Asset) Value = ∑ Present Value (Free Cash Flow, discounted at WACC)

In the a very simple case where the terminal value of equity cash flow and debt cash flow occur in one period, the present value of equity plus the present value of debt discounted at their respective discount rates equals the present value of free cash flow discounted at the WACC. The present value of the debt plus equity equal 274.45 and the present value of 300 discounted at the WACC of 9.31% also equates to 274.45. This example is illustrated below using the cost of equity and the cost of debt from the above simple points. Note that when the discounting is for more than one period this equality does not exist.

Period	0	1				
	PV of Future Cash Flow	Future (Term) Cash Flow		Cost of Capital	Market Percent	WACC
Equity Cash Flow (Dividend)	181.00	200.00	Equity	10.5%	65.95%	6.92%
Debt CF (Interest + Repayment)	93.46	100.00	Debt	7.0%	34.05%	2.38%
Total Free Cash Flow (EBITDA - Taxes - Cap X)	274.45	300.00	Total			9.31%
Enterprise Value from PV of Free Cash Flow	274.45	300.00				

(7) In order for the present value of free cash flow to correctly reflect the value of equity plus the value of debt, the WACC must be weighted using market values and the cost of debt and the cost of equity must be incremental costs. When summing the debt and equity values to derive free cash flow, the relative proportion of equity cash flow and debt cash flow that influences drives the total free cash flow and the enterprise value depends on the future values of the equity and debt, not the historic amounts of debt and equity invested. For example, consider a case where the equity value is very high relative to the value of debt because of high expected growth in cash flow while the book value of debt is similar to the value of equity (prospective value relative to book value can be illustrated by the case of Facebook in the film Social Network where the market value had nothing to do with the couple of thousand that was invested to launch the company.) In this example, the value of equity at the market value is much more than the value of debt and the weighting of future free cash flow must account for this fact. This means that weighting percentages used in computing the average cost of debt and equity capital for application to free cash flow must be calculated from market values and not book values. The components of the WACC include:

Debt Discount Rate = Current Risk Free plus Credit Spread from Future Risk

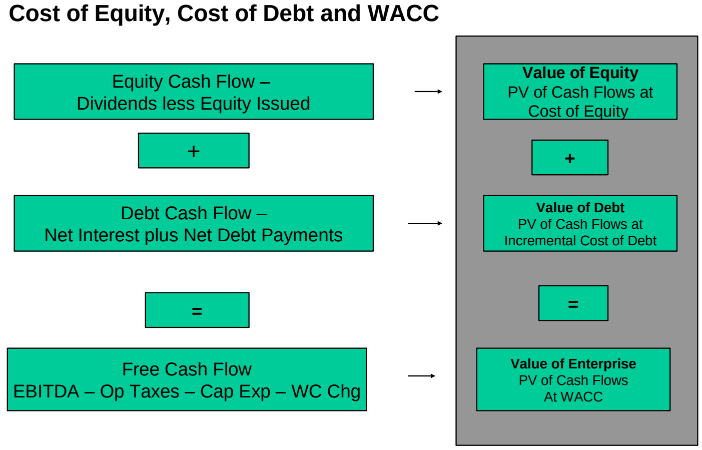
Equity Discount Rate = Required Rate of Return that Reflects Risk of Future Equity Cash Flows

Debt Percent in WACC = Market Value of Net Debt/Enterprise Value

Equity Percent in WACC = Market Value of Equity/Enterprise Value

The diagram below illustrates how since free cash flow is the sum of equity and debt cash flows and since enterprise value is the sum of debt and equity value, that the enterprise value is the present value of free cash flows.

Equity Cash Flow, Debt Cash Flow, Free Cash Flow and Cost of Equity, Cost of Debt and WACC



Since the value of the enterprise is the value of debt plus the value of equity, the value of

equity is the enterprise value less the value of the debt.

Equity Value (Equity Cash Flow, discounted at equity Cost) =
Enterprise Value – Net Debt Value (Debt Cash Flow, discounted at debt cost)

(8) The effect of the tax deduction of interest expense on debt is accounted for in the WACC calculation rather than in the cash flow in classic application of the discounted cash flow. The WACC is lower from the WACC which increases the enterprise value. The lower WACC is the reason operating and not actual taxes are used in the free cash flow calculation;

	Percent	Cost	Tax	Weighted
Debt	Market	Incremental	1-Marginal Tax Rate	Mkt Wt x Incremental Cost x (1-Tax Rate)
Equity	Market	Incremental		Mkt Wt x Incremental Cost
WACC				Sum

(9) In the weighted average cost of capital calculation, the equity return increases in proportion to the amount of debt in the capital structure, keeping the overall cost of capital constant. This is often applied through computing un-leveraged betas and then re-leveraging the betas as illustrated in the equations below which assume no tax:

Asset Beta = Equity Beta x Market Equity/Market Capital + Debt Beta x Market Debt/Market Capital

If the debt beta is zero,
Asset Beta = Equity Beta x Market Equity/Market Capital

In terms of the equity beta:
Equity Beta = Asset Beta x Market Capital/Market Equity

(10) When using a financial projection model, the inflation rate should be consistent with the discount rate and the discount rate should be above the inflation rate reflecting a real interest rate. If the inflation rate is changing, then the discount rate should also change. Further, when discount rates change, the present value factors must be compounded rather than calculated from spot discount rates. For example, consider an extreme example where the inflation rate is 100% in one year and then it declines to zero for the remaining forecast horizon. If there is no cash flow in the year the inflation rate is 100%, using the standard NPV formula with spot rate would not account for the decline in the value of future cash flows from the decline in purchasing power when the inflation rate is 100%. With changing inflation rates or changing discount rates, the discount rate should be computed using the following formulas:

Step 1: Compute compounded index: current index = prior index x (1 + current discount rate)
Step 2: Discount factor = 1/current index

If multiple currencies are being discounted, the same value should be derived whether valuation is made in a common currency or whether the valuation is made in different currencies and then the present value is converted to the common currency. The real interest rate, the company risk premium, the country risk premium and the real terminal growth rate should all be the same and not depend on the currency of the model. The only factor depends on the currency is the inflation rate and if the prospective exchange rate is made to be a function of the inflation rate then the value should be identical whether the model is expressed in the common currency or in the

original currencies. If the forward exchange rate is different than the rate implied by differential inflation, then the models should be stated in the original currency.

PAKED

Why growth cannot be above the economic growth

Corporate valuations depend on the assumption that companies will reach a tranquil zero real growth rate in a period of somewhere between five and ten years, perhaps after a smooth transition period until this supposed harmony is obtained. If companies would reach this tranquillity stage, then the value of those prospective stable cash flows could easily be computed using a perpetuity formula. This chapter introduces the theory of computing terminal value and addresses whether it is reasonable to assume for the purpose of valuation that companies will reach a an equilibrium stage where growth rates slow down and excess returns are diminished.

The great telecom meltdown that was part of the dot com bubble involved an assumption that very fast growth could be achieved over long periods of time. The fallacy of this assumption is illustrated in the table below which shows the time that takes for an industry to overtake the economy using different growth rates and different shares of the economy. The term overtaking the economy means that there is nothing at all left in the economy other than the industry in question. For example, if telecom companies overtake the economy, then people would not eat, they would not buy houses, they would not go to the doctor; they would only play with their cell phones. The table can be easily constructed by simply constructing a hypothetical number for an economy and growing the economy with productivity growth and population growth using the following steps:

1. Make an assumption about the growth rate in the overall economy and use an arbitrary number such as 100 to represent the size of the economy. For example, you could assume the economy has a size of 100 and it grows by 2% population growth plus productivity of .5% (it is very difficult to achieve high rates of productivity growth in mature economies).

2. Make assumptions about the industry including the current size of the industry relative to the economy and the growth rate in the industry. For example, say the industry is 2% of the economy and grows at 15%.

3. Compute the indices for the economy and the industry growth have been established, the industry divided by the economy can be computed. The table demonstrates that if a high growth rate is used it is very unrealistic to assume that an industry can grow at high rates. For example, if the growth rate is 20% and the industry is 10% of the economy, it takes only 15 years for the nothing to be left in the economy other than the industry in question. This very simple analysis demonstrates that making assumptions that a company can achieve high growth for long periods of time must be ruled out in valuations.

Years to Overtake the Entire Economy

		Initial Percent of Economy			
		2.5%	5.0%	10.0%	20.0%
Industry Growth	5%	101	101	97	68
	10%	53	43	33	23
	20%	24	20	15	11
	30%	16	13	10	7
	40%	12	10	8	6

The number of years it takes for an industry to completely overtake the economy can be computed using the MATCH function. To use this function, enter the number 1 as the target number to be found (or matched) and then enter the range the measures the percent of the industry relative to the entire economy. As the percentage is an increasing number, you do not have to enter a “match type” at the end of the formula.

MATCH(1, test range)

Dividend Discount Model and P/E Ratio to Derive Cost of Capital

The dividend discount model can be used to estimate the cost of capital given the value of a stock along with an estimate of the growth rate in dividends. The model estimates the cash flow that will accrue to investors from owning stock and then discount that stream of money to ascertain its value today. By assuming that marginal investors, who are the ones buying and selling shares, believe the growth rate in dividends is constant forever, one can establish the well known dividend discount equation for computing the cost of capital. The value of a share is the next anticipated dividend divided by the difference in the cost of equity and the growth rate in dividends (the mathematics of the formula requires using the next year cash flow rather than the current period dividend):

$$P_0 = D_1/(k\text{-}g)$$

Rearranging, the formula becomes:

$$k = D_1/P_0 + g.$$

This equation implies that lower growth results in a lower estimated cost of equity capital as a lower discount rate must be used to arrive at the same share price. Because the model estimates the cost of capital from assumed investor valuation models, the inputs to the model -- dividend yield and the growth rate -- are not the direct drivers of risk and cost of capital as was the beta and the equity risk premium in the CAPM.

The model has many problems including the fact that long-term growth rates in dividends predicted by sell side analysts and often used in the model are generally optimistic; that earnings growth rates cannot be substituted for dividend growth rates when dividend payout ratios are changing; that assuming a company will stabilize after a certain time period presents subjective estimates as to when will stabilization occur and what will be the long-term growth rate and whether the model should be applied using a sustainable growth rate.

Inference of cost of capital from an investor valuation model does not require use of dividend forecasts to establish stock price valuation. Other valuation formulas can be used to infer the cost of equity capital, instead of using the present value of projected dividends as the underlying valuation model. In particular, a model that is used to evaluate price to earnings ratios can be the basis for estimating the implicit cost of equity capital. A formula that explains the P/E ratio in terms key value drivers – the ability to earn more than the cost of capital and the ability to grow that difference – is given by the equation:

$$P_0/E_1 = [1\text{-}g/ROE]/[k\text{-}g]$$

In this formula, P/E is the forward price to earnings ratio, g is the growth rate in earnings per share, ROE is the earned return on equity and k is the cost of equity capital. Through re-arranging the P/E formula, one can compute the cost of equity from the P/E ratio. In this formula, the cost of equity capital is driven by the growth, the return on equity, and the forward earnings per share:

$$k = [EPS_1 \times (1\text{-}ROE/g)]/P_0 + g$$

If you want to apply either the P/E or the standard dividend discount model, you can use a file provided on the CD. After you enter ticker symbols, the file retrieves data from the Yahoo.Finance website and then computes the cost of equity using one of the two formulas discussed above. Growth rates come either from investment analyst projected five year growth rates which are often used in the analysis.

Growth rates can be extracted from one year projected growth rates or from the sustainable growth rate formula:

Sustainable growth = ROE x (1-dividend payout)

Laclede

Select Method ----------------------------------->

				Forward	Five Year Projected	Reported				
			Ticker	PE Ratio From Yahoo or Forward EPS/Share Price	Growth Over Next 5 Years (Growth Page from Yahoo)	Reported by Yahoo (Base Page)	**Equity Cost of Capital from PE Formula**	**Forward Dividend Yield**	**Equity Cost of Capital from DCF Model**	
	Company Name		Ticker	PE Ratio	Growth	ROE	**Equity Cost**	Dividend Yield	Equity Cost	Mkt/Book
1	Microsoft		MSFT	9.82	10.2%	50.0%	**18.32%**	2.77%	12.99%	4.97
2	Nokia		NOK	11.15	13.5%	27.5%	**18.07%**	3.95%	17.45%	N/A
3	Vodaphone		VOD	8.13	6.7%	7.5%	**7.95%**	4.10%	10.80%	0.89
4	General Electric		GE	11.40	8.7%	16.4%	**12.81%**	11.33%	20.00%	1.08
5	Google		GOOG	15.34	19.0%	16.6%	**18.06%**	0.00%	19.00%	4.05
6	Fed Exp		FDX	14.76	5.8%	4.9%	**4.61%**	0.88%	6.67%	0.98
7	AES Corp		AES	5.50	14.2%	35.6%	**25.13%**	0.00%	14.20%	1.13
8	Boeing		BA	7.45	8.4%	68.9%	**20.19%**	4.46%	12.86%	N/A
9	Freeport McMoran		FCX	15.63	6.0%	1.0%	**-25.99%**	0.00%	6.00%	7.73
10	IBM Corp		IBM	10.43	9.8%	58.8%	**17.82%**	1.96%	11.79%	10.03
11	McDonalds		MCD	13.58	9.0%	30.1%	**14.18%**	3.53%	12.56%	4.70
12	Sprint Nextel		S	(19.05)	3.4%	1.0%	**15.75%**	0.00%	3.36%	0.62
13	Southwest Air		LUV	10.09	13.3%	3.0%	**-20.94%**	0.29%	13.62%	1.05
14	UPS		UPS	15.98	10.2%	31.7%	**14.43%**	3.41%	13.60%	7.71
15	Con Ed		ED	11.65	2.5%	9.8%	**8.90%**	6.01%	8.55%	1.11
16	BP		BP	7.49	4.5%	22.9%	**15.22%**	8.13%	12.63%	1.42
17	Exxon Mobil		XOM	11.27	8.3%	38.5%	**15.28%**	2.27%	10.60%	3.09
18	Daimler Chrysler		DAI	12.50	5.0%	4.8%	**4.70%**	1.87%	6.87%	N/A
19	Deutche Telcom		DT	11.39	4.3%	3.6%	**2.62%**	9.72%	14.02%	N/A
20	Goldman Sachs		GS	15.04	13.5%	4.3%	**-0.58%**	1.57%	15.07%	1.03
21	Walmart		WMT	13.90	11.6%	20.4%	**14.71%**	2.03%	13.63%	3.22
22	Yahoo		YHOO	31.02	15.5%	4.1%	**6.48%**	0.00%	15.53%	1.60
23	Nigas		GAS	11.80	4.5%	12.5%	**9.91%**	5.55%	10.05%	1.56
24	Laclede		LG	15.24	3.5%	14.2%	**8.44%**	3.95%	7.45%	1.70

By far the most difficult part of the dividend discount model or the P/E equation is estimating the future growth rate in earnings or dividends. A number of financial economists have demonstrated that investment analyst estimates of growth in earnings, particularly the five year forecasts are strongly biased in an upward direction. If the stock market is anywhere near efficient and analyst growth rates are consistently high, stock prices should reflect the unbiased growth estimates rather than the upwardly biased sell-side analyst forecasts. This means that use of analyst forecasts as the growth rates in the dividend discount model or the P/E formula will over-estimate the cost of capital inferred from the DCF valuation equation.

Some of the economists who have noted the bias in growth rates are summarized below. For example, their text titled "Valuation: Measuring and Managing the Value of Companies" published in 2005, Tim Koller, Marc Goedhart and David Wessels state that "*analyst forecasts focus on the short term and are severely upward biased*."[2] Enrique Arzac comments on the difficulty of predicting growth rates and the potential for the DCF model to over-estimate the cost of equity as follows: "*The problem with [the dividend discount] approach is that long-term dividend growth rate of an individual company cannot be estimated with any degree of precision. Hence, the dividend growth model is not likely to produce reliable estimates of the cost of equity capital of individual companies….A number of empirical studies have documented optimistic bias in analysts' opinions….*"[3] Claus and Thomas conclude that earnings and dividend growth rates used for the DCF model "exhibit substantial optimism bias and need to be adjusted downward."[4]

[2] Koller, T., Goedhart, M., Wessells, D., 2005, Valuation Measuring and Managing the Value of Companies, Hoboken, New Jersey, John Wiley & Sons p. 305.
[3] Ibid, Arzac, Enrique, 2005, pp. 43-44.
[4] Ibid, Claus and Thomas, 2001, p. 1662.

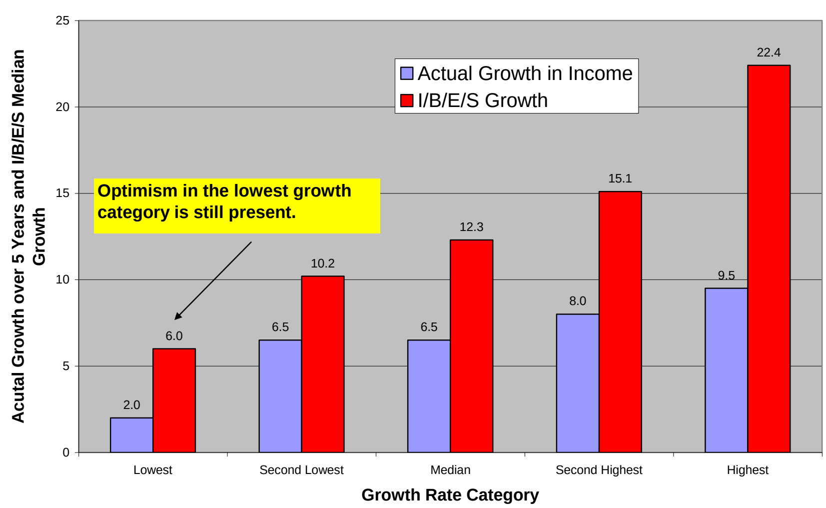
Louis Chan and his coauthors conclude that "*over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five year growth rate of about 9 percent for income before extraordinary items.*"[5] Fama and French state that "*In short, we find no evidence to support a forecast of strong future dividend or earnings growth at the end of our sample period.*"[6]

Questions of whether analyst forecast of earnings provide any predictive power have been studied for many years. In one of his textbooks, Aswath Damodaran finds that any superiority of analyst forecasts deteriorates quickly as the forecast period is extended.[7]

> *The analyst forecasts outperform the time series model for one-quarter ahead and two-quarter ahead forecasts, do as well as the time series model for three-quarter ahead forecasts and do worse than the time series model for four-quarter ahead forecasts. Thus, the advantage gained by analysts from firm-specific information seems to deteriorate as the time horizon for forecasting is extended. There is an intuitive basis for arguing that analyst predictions of growth rates must be better than time-series or other historical-data based models simply because they use more information. The evidence indicates, however, that this superiority in forecasting is surprisingly small for long-term forecasts and that past growth rates play a significant role in determining analyst forecasts. . . . Analyst forecasts may be useful in coming up with a predicted growth rate for a firm but there is a danger to blindly following consensus forecasts. Analysts often make significant errors in forecasting earnings, partly because they depend upon the same data sources (which might have been erroneous or misleading) and partly because they sometimes overlook significant shifts in the fundamental characteristics of the firm. The secret to successful valuation often lies in discovering inconsistencies between analysts' forecasts of growth and a firm's fundamentals.*

The article by Louis Chan allows comparison of growth rates made by analysts that are compiled by a service called I/B/E/S. The graph categorizes growth rates for companies with different levels of growth and demonstrates that even companies with low growth have strongly upward biased projections. For each category, the bar that shows actual growth is far below the projected growth over the same period.

IBES Growth and Actual Growth from Chan Article



---

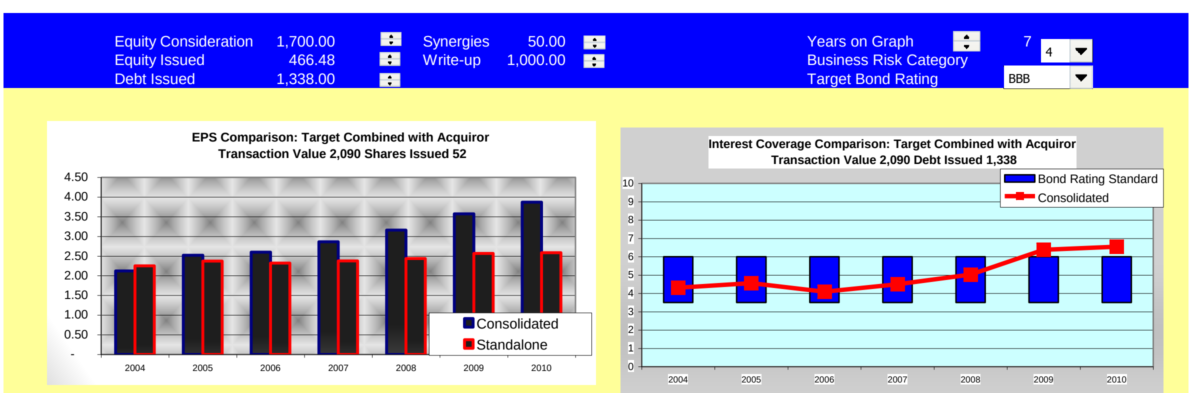
[5] Chan, L., Karceski, j and Lakonishok, J, 2003, The Level and Persistence of Growth Rates, Journal of Finance, 58, p. 672.
[6] Fama and French, 2002.
[7] Damarodan on Valuation: Security Analysis for Investment and Corporate Finance, pp 165-166.

Valuation in Alternative Models

All four model types introduced in this chapter – corporate models, project finance models, leveraged acquisition models and integrated merger models -- compute financial statements for the company being evaluated. However, the manner in which valuation is derived from the models and the ways risks can be measured is very different. Corporate models generally compute value from projected earnings or from forecasted free cash flow using the discounted cash flow ("DCF") method. The foundation of this approach is the presumption that the value of real assets is not dependent on the manner in which the assets are financed. A simple definition of free cash flow – cash flow that accrues to debt investors, equity investors and anybody else who put money into the company and expects a return – is the following:

Free Cash Flow = EBITDA – Operating Taxes – Capital Expenditures – Working Capital Change + Deferred Tax Changes

In contrast to valuation approaches in corporate models that depend to a large extent on terminal value and cost of capital assumptions, project finance analysis in essence backs into the value of the prospective equity investment through assessing whether an adequate equity return can be achieved. The equity return in these models depends in turn on the amount of debt that can be lent to the project. This means that project finance models do not have the same problem that dramatically different results come from changing variables that are very difficult to estimate. Leveraged buyout models are similar to project finance models in the sense that one can back into the value of a company accounting for the amount of debt that lenders will commit to the transaction. With acquisition models value is computed through measuring the maximum entry multiple or premium that can be paid for a company such that a given the equity internal rate of return can be achieved. As with the project finance model, the rate of return to equity investors depends to a great extent on how financing of the transaction is structured, but not on terminal growth and subjective cost of capital estimates. Finally, merger integration models also back into the value of the target company and the acquisition premium. This time however, the value is derived through comparing earnings per share and other financial ratios before and after a merger. Value can be derived by determining whether earnings per share for the combined company increase whether financial ratios of the new combined company remain strong enough to support the desired credit rating. Use of an integrated model to back into the value of a company is illustrated below. In this artificial example, the transaction results in increased earnings (accretion) and it also maintains the bond rating within the standards for a BBB company given the assumed business category.[8] If the equity consideration is increased or the amount of debt used in the transaction changes or the accounting treatment changes, the accretion may no longer exist.



[8] The bond rating band is computed from tables provided by Standard and Poor's which show provide the range in financial ratios that are used to gauge bond ratings given a certain business risk (chapter 4).

The alternative approaches to classic free cash flow valuation from project finance models, leveraged acquisition models and integrated merger models eliminate the need for debating the weighted cost of capital or the terminal growth rates. Instead, market information on the structure of the financing and direct information on the required returns for equity holders forms the foundation of the valuation process. If value is to be computed using the alternative models, the financial models must address detailed aspects of how free cash flows accrue to debt and equity investors. The cash flow process is different depending on the structure of the transaction implying that alternative starting points, different time period conventions and distinctive calculations of the manner in which cash flow is dispersed to debt and equity investors must be incorporated in the alternative types of models.

The difference in valuation techniques that are implied from using the alternative models is summarized in the table below. Subsequent chapters will further discuss the advantages and disadvantages of using alternative valuations.

Valuation Analysis in Alterative types of Models

	Corporate Model	Project Finance	LBO Model	M&A Integration Model
Valuation from Model	Present Value of Discounted Free Cash Flow or Multiples	Investment Decision and Implied Value depends on Equity IRR versus Market Hurdle Rate	Entry Multiple and Acquisition Premium Depends on Equity IRR and Hurdle Rate	Acquisition Premium Depends on Earnings per Share Acretion and Debt Ratios
Key Valuation Parameters	Weighted Average Cost of Capital, Multiples, Terminal Growth	Debt Capacity, Debt Terms	Senior and Subordianted Debt Financing and Exit Multiple	Sources of Funds Used for Tranasction and Assessment of Credit Quality
Traditional Risk Assessment from Equity Perspective	Sensitivity Analysis and Scenario Analysis of DCF and Multiple Value	Sensitivity Analysis and Scenario Analysis of Equity IRR	Sensitivity Analysis and Scenario Analysis of Equity IRR	Sensitivity Analysis and Scenario Analysis of EPS Accrection and Credit Quality
Traditional Risk Assessment from Debt Perspective	Break-even Analysis to Determine Ability to Re-finance and Maintain Credit Rating	Break-even Analysis to Determine at what Point Cash Flow Cannot Service Debt	Break-even Analysis to Determine IRR on Senior and Subordinated Debt	Break-even Analysis to Determine Prospective Credit Rating
Monte Carlo Analysis with Model	Probability Distribution of EPS and DCF Valuation	Probability Distribution of Equity IRR and Probability of DSCR below 1.0	Probability Distribution of Equity IRR, Senior IRR and Junior IRR	

Computation of Free Cash Flow from Financial Statements

In all types of models, free cash flow is generally computed to establish asset value, although equity cash flow is the emphasis of project finance and acquisition models. Traditional finance theory suggests that valuation of an investment should be measured from the present value of cash flows as if the plant was financed without any debt -- that is, discounted free cash flow. After tax cash is what has value to investors; cash is what lenders need in order to be repaid; cash is what customers pay and em ployees want. The notion of using cash flow and a discount rate that are independent of financing is intuitive. Say you are valuing a manufacturing facility. If you take a tour of the factory, its value should be a function of its efficiency, its ability to produce good products, its construction cost, its cost to operate and maintain and other physical factors. Its value should not depend on the manner in which money was raised to pay for construction.

Without taxes, it is straightforward to demonstrate that free cash flow is equal to the cash flow accruing to equity holders plus the cash flow accruing to debt holders, minority owners, preferred shareholders and any other investors in a company. While it is well known to professionals familiar with valuation that enterprise value is equal to the present value of free cash flows discounted at the weighted average cost of capital, it is useful to review basic ideas underlying the notion. The net cost and benefits of alternative decisions are made by computing the present value of discounted free cash flow at the after-tax cost of capital which depends on the risk of the project. If the free cash flows (that accrue to all claimants, including debt, equity, preferred stock, minority interest and others) are discounted at a weighted average of the discount rates for each element, then the present value of free cash flows equal the sum of the present values of each claimant. The sum of the value of debt and equity and other claimants is defined as the enterprise value of a firm. This means that the present value of free cash flow at the weighted average cost of capital is equal to the present value of equity cash flows discounted at the cost of equity, plus the present value of debt discounted at the discount rate for debt and so forth. Equity value to investors can be established from enterprise value by subtracting current market value of debt from the asset value.

Internal Rate of Return and Net Present Value

Decisions associated with investments should be gauged by considering whether marginal benefits of the investment exceed marginal opportunity costs. Marginal benefits of making an investment are the free cash flows that are generated when the plant operates. Marginal opportunity costs include the initial investment and the rate of return that could have been earned by investors if another investment with a comparable risk profile would have been made. This basic economic principle of assessing decisions with opportunity cost means that once after-tax cash flow is established, the value of an investment should be assessed by computing the net present value of the cash flows measured at an after-tax discount rate that reflects risk of the project. All else equal, with riskier the cash flows, the value of an asset is lower because the opportunity cost from making similar high risk investments is more. If we are investing in a risk investment and we were making another investment with comparable high risk, we would be able to achieve a higher return.

When presenting outputs in a financial model, risk and value of an investment can be assessed using with a risk-adjusted discount rate using two methods: net present value or internal rate of return. One way to assess the marginal benefits relative to the marginal costs of an investment is to compute the present value of free cash flows at a discount rate that reflects risks that would be present if only equity was used in financing the plant – i.e., it should not reflect the risks that are created by adding debt to a project. A second approach to compute the net economic value of a project is to compare the internal rate of return generated from the free cash flow with the cost of capital. Some finance texts distinguish between net present value and internal rate of return and suggest that a net present value criterion is superior to internal rate of return.[9] This is a distinction with little practical import in most real world financial analyses. Since the internal rate of return can be defined as the rate of return that causes the net present value of a project to be zero, comparison of the internal rate of return to the cost of capital is an effective and intuitive way to assess value. The internal rate of return tells managers what the level of the rate of return on their investment. Further, the internal rate of return is very easy to compute using spreadsheet programs and it can be determined for different time frames (for example, the IRR can be computed over a period of ten years rather than over the entire life of the project).[10]

[9] See Brealey and Meyers, Principles of Corporate Finance 4th Edition, McGraw Hill Inc., New York, 1991.

[10] The difference between project IRR – the internal rate of return earned on free cash flow -- and the all-equity cost of capital can be used to measure economic profit. Through multiplying the IRR difference by the cost of the project a measure of the economic profit earned by the investment can be obtained. Because electricity generating projects require a lot of up front capital, small differences between the earned return and the cost of capital can lead to significant economic profit. This is very similar to the traditional positive net present value rule whereby all projects with positive net present value should be selected. If economic profit is positive, the investment is generating positive

Computing Internal Rate of Return (IRR) with IRR, XIRR and MIRR Functions

The fundamental definition of the internal rate of return is the discount rate that makes the net present value zero. A definition that is much easier to explain is simply that the internal rate of return measures the growth rate in investor cash. The growth rate in cash is after all the thing that investors should be most interested in. For example, if there is an cash outflow in the first period of 100 and a subsequent cash inflow of 120, then both the growth rate and the IRR are 20%, demonstrating that the IRR is the growth rate. Similarly, if the cash outflow is 100 and the cash inflow in second period is zero and the cash flow in the third period is 120, then the compound annual growth rate and the IRR are both around 9.54%. Again the IRR equals the growth rate. In measuring the growth rate in cash flow, an issue that complicates the calculation is the treatment of returns that can be earned on cash flow that occurs after the initial outflow and before the final outflow of cash flow. When equating the IRR with the growth rate, the IRR function assumes that any cash flow realized in middle periods can be re-invested at the IRR itself. For example, if you receive 100 in year 2, the IRR function assumes that this amount of cash can be re-invested and earn the same return as the computed IRR. This can be a very bad assumption, especially when the IRR is very high or very low. Instead, it may be much better to assume that the 100 may is re-invested at the overall cost of capital. The modified IRR computed with the MIRR function solves this problem. If the weighted cost of capital is used as the re-investment rate in the MIRR, and if the project earns its cost of capital, then the IRR is the same as the IRR. However, the variation in the IRR over different scenarios is less.

The modified IRR evaluates cash outflows and cash inflows in a different manner. The present value of the cash inflows are computed at a given financing rate. The future cash outflows are grown (or the future value is computed using a given re-investment rate. The modified IRR is then the implied compound growth rate for the present value of outflows relative to the future value of inflows as illustrated below:

MIRR = (FV of Inflows at Re-investment Rate/PV of Outflows at Finance Rate)^(1/periods)

When using the IRR and MIRR functions in excel, it is useful to realize that a few quirks can occur. If you are applying the IRR function, the number is not affected by whether there are leading or trailing zeros. However, when using the MIRR function, the answer is different (because the timing of the present value and the future value calculations.)

Verification of XIRR

Step 1: Convert the annual rate into a daily rate using the formula (1+Annual Rate)^(1/365)-1.

Step 2: Then compound using accumulated days, beginning with accumulated days of zero in first period (1+daily rate)^(accumulated days)

Step 3: Use the SUMPRODUCT command to compute the present value

PARKED

(1) To make a decision using internal rate of return, one should compare the earned return to a cost of capital percentage that reflects risks of the cash flows. In theory, the rate of return on

value. Given that the components of free cash flow have been established in earlier chapters, most of the remaining discussion addresses how to compute the all-equity cost of capital for an electricity generating plant.

free cash flow is assessed through measuring opportunity cost with a discount rate that is not affected by debt except for the tax effects. The discount rate that measures risk if no debt existed is known as the all-equity cost of capital. This is a similar concept to the weighted average cost of capital ("WACC"), but unlike the WACC which often changes when the debt leverage changes, the all equity cost of capital is entirely independent of from the leverage. Using the all-equity discount rate, the value of an asset does not depend on the financing of that asset because both the free cash flow and the discount rate are independent of the amount of debt in the capital structure.

(2) The cost of capital applied to future cash flows should account for contractual aspects of the investment that affect the future volatility in cash flow;

(3) The discount rate applied to free cash flow of a particular project is not the same as the discount rate applied to different investments made by the same company;

Rearranging, the formula becomes:

$$k = D_1/P_0 + g.$$

This equation implies that lower growth results in a lower estimated cost of equity capital as a lower discount rate must be used to arrive at the same share price. Because the model estimates the cost of capital from assumed investor valuation models, the inputs to the model -- dividend yield and the growth rate -- are not the direct drivers of risk and cost of capital as was the beta and the equity risk premium in the CAPM.

The model has many problems including the fact that long-term growth rates in dividends predicted by sell side analysts and often used in the model are generally optimistic; that earnings growth rates cannot be substituted for dividend growth rates when dividend payout ratios are changing; that assuming a company will stabilize after a certain time period presents subjective estimates as to when will stabilization occur and what will be the long-term growth rate and whether the model should be applied using a sustainable growth rate.

Inference of cost of capital from an investor valuation model does not require use of dividend forecasts to establish stock price valuation. Other valuation formulas can be used to infer the cost of equity capital, instead of using the present value of projected dividends as the underlying valuation model.

Through re-arranging the P/E formula, one can compute the cost of equity from the P/E ratio. In this formula, the cost of equity capital is driven by the growth, the return on equity, and the forward earnings per share:

$$k = [EPS_1 \times (1\text{-}ROE/g)]/P_0 + g$$

If you want to apply either the P/E or the standard dividend discount model, you can use a file provided on the CD. After you enter ticker symbols, the file retrieves data from the Yahoo.Finance website and then computes the cost of equity using one of the two formulas discussed above. Growth rates come either from investment analyst projected five year growth rates which are often used in the analysis.

(1) The classic weighting in the WACC calculation that is universally taught and used in investment banking analysis does not measure the value of debt and equity when the holding

period is more than one period. From a mathematical standpoint, it is not true that the equity discounted at the equity cost of capital plus the debt discounted at the debt cost of capital equals free cash flow discounted at the WACC. This distortion occurs because of the fact that (A+B) raised to the power of more than one does not equal A to the power plus B to the power. In the case of the weighted average cost of capital, one can think of the cash flow of debt as A and the cash flow of equity and B as the cash flow of debt. In terms of a simple example with one future cash flow for debt and one cash flow for equity:

Debt Cash/(1+Debt Cost) + Equity Cash/(1+Equity Cost) < Free Cash/(1+WACC),

Where:

WACC = (Debt Cash/Free Cash) x Debt Cost + Equity Cash/Free Cash x Equity Cost

To see this, consider a simple model where cash flows – both debt and equity -- are received in a lump sum in ten years. The debt cash flow received in ten years is 100 and the equity cash flow received in ten years is 200. The actual value of debt and equity is 75.9, but the valuation of the combined 300 of cash flow at the computed WACC results in a valuation of of 118.02. The example shows that the incorrect weighting with a large difference between the equity cost and the debt cost causes a large error in the computation of WACC.

Period	0	10				
	PV of Future Cash Flow	Future (Term) Cash Flow		Cost of Capital	Market Percent	WACC
Equity Cash Flow (Dividend)	14.51	200.00	Equity	30%	19.11%	5.73%
Debt CF (Interest + Repayment)	61.39	100.00	Debt	5%	80.89%	4.04%
Total Free Cash Flow (EBITDA - Taxes - Cap X)	75.90	310.00	Total			9.78%
Enterprise Value from PV of Free Cash Flow	118.02	300.00				
Difference: Equity + Debt versus PV of FCF	42.12					
Percent Difference with WACC Problem	55.49%					

WACC = (Future Value of Debt + Equity Cash)/(Present Value of Debt + Equity)

The remarkable thing about this relatively minor point is that it is completely ignored in finance texts and in teaching WACC in business schools.

Appendix: Capitalization Rates in Real Estate

The definition of a capitalization rate is net cash flow realized from a property divided by the net rental. For example, if the value of a property is 1,000 and net rentals for an annual period are 100, then the cap rate is 10%. The inverse of the cap rate is much like the P/E or EV/EBITDA multiples in corporate finance. Many of the ideas in developing the capitalization rate are similar to concepts used in evaluating the P/E ratio or the EV/EBITDA ratio.

If rentals would remain constant for an indefinite period with no growth and no taxes, then the cap rate is simply the overall required rate of return on the property as illustrated below:

Value of Property = Annual Net Rental Cash Flow/Required Annual Return on Cash Flows

Or

Required Annual Rate of Return = Annual Rental Cash Flow/Value of Property

The presence of growth rates limited property lives and taxes makes the analysis somewhat more complex, but one can still derive the required return from the cap rate if the growth rates (there could be differences between long-term and short-term growth rates). To illustrate the process by which one can derive the discount rate in the presence of taxes, growth and a limited life, consider the following formula:

Value = PV of After Tax Cash Flow at Required Rate of Return,

And

Cap Rate = Pre-tax Cash Flow/Value

Using these formulations, one can back into the annual rate of return. The only issue that is a little difficult is the tax depreciation that depends on the value of property sold in a transaction. Since the value of transaction depends on the tax deductions, but the tax deductions also depend on the value of the transaction, a circular reference must be resolved. This can be accomplished through entering a fixed value for the tax basis and then copying and pasting the derived value to this number until a consistent value is derived. The table below illustrates how different derived costs of capital result from varying short-term growth rates and changes in the cap rate.

PARKED

Before delving into the adjustments for enterprise value, the treatment of accumulated other comprehensive income in the equity investment must be addressed. Accumulated other comprehensive income appears on the balance sheet because, among other reasons, derivative assets and liabilities as well as currency translation adjustments are placed on the balance sheet without affecting income. If an activity is considered hedging but causes the value of derivatives to deviate in market value, the market value of the derivative is included on the balance sheet, but the income associated with the change in value is not included in income. If an asset or liability has a change in value, it generally affects income. However, because some derivative assets and liabilities do not affect income, accumulated other comprehensive income is used instead. Because this account arises from adjustments to asset accounts, the amount of accumulated other comprehensive income should not directly or indirectly represent investments made by equity investors. Therefore, when computing the return on equity capital, the denominator should be adjusted by deducting the amount of accumulated other comprehensive income.

Summary of Treatment of Balance Sheet Items in the Bridge Shareholders Equity and Invested Capital		
Balance Sheet Item	**General Treatement in Bridge**	**Comments**
Accumulated Other Comprehensive Income	Subtract from Equity Capital	AOCI does not represent capital invested
Long and Short term Debt and Financial Leases	Include as Invested Capital at Book Value	Debt and equity capital are invested to support EBITDA
Preferred Stock	Same Treatment as Debt	Preferred stock can be invested as well as debt
Minority Interest	Same Treatment as Debt	Minority interest is similar to common equity
Surplus Cash	Subtract from Debt and Equity	Some invested capital dedicated to surplus cash
Operating Cash	No Adjustment	Operating cash investment to support EBITDA
Short-term Accounts Recievable and Inventory	No Adjustment	A/R and Inventory investment to support EBITDA
Long-term Notes Receivable and Accounts Receviable	Subtract from Debt and Equity	Investment does not generate EBITDA
Deferred Expenses and Prepaid Expenses	No Adjustment	Same rationale as A/R
Assets not currently producing cash flow (land etc.)	Subtract from Debt and Equity	Investment made to support assets not necessary for EBTIDA
Non Assocaited Investments	Subtract if Income not in EBITDA	If non-associated income is in EBITDA, subtract from invested capital
Discountinued Assets and Liabilities	Subtract if Income not in EBITDA	Some invested capital dedicated to discontinued operations
Unfunded Pension Obligations	Add to invested capital	Invested capital would have to be used to fund pensions
Derivative liabilities (assets) related to interest rate swaps	No Adjustment	Does not represent invested capital
Derivative liabilities (assets) related to commodity hedges	No Adjustment	Does not represent invested capital
Accumulated Deferred Taxes	No Adjustment	Not capital invested to support EBITDA
Stock Options	No Adjustment	Capital invested included in equity